

# The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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## The Aitken Hot and Cold Blast Coking Ovens.

We show in the accompanying illustration a vertical section of the Aitken coking oven, which has lately attracted some attention in this country. The construction is shown so clearly in our illustration that a detailed description is not needed to make it plain to the ironmaster. Its operation may be described as follows:

After the oven has been dried and heated, it is charged in the usual way, and as soon as the heat has caused sufficient gas to be evolved to produce combustion, the blast is turned into the oven above the surface of the coal to be coked. The introduction of air by blast creates at once intense heat, which again causes more gas to be given off. To meet this the amount of air is regulated by the blast, so that in the mixture of carburated hydrogen and air in the oven over the coal there is always some gas unconsumed. The quantity of air required is greatest in the early stages of the charge, and is gradually diminished toward the close. When all the gas has been given off the coke is allowed to cool down or it is watered out and drawn in the ordinary manner.

The heat caused by the blast is very high, but as the air is directed above the surface of the burning coal, and not through it, only the coal gas (carburated hydrogen) is consumed in the process of combustion and the generation of the heat, while the solid carbon in the form of coke remains at the bottom of the oven entirely unaffected by combustion which goes on above it. Hence the large increase in the quantity of coke produced by this process. Further by the introduction of the air blast over the coal in the oven, 66 per cent. of excellent coke has been obtained from coals which could not be made into good coke by the ordinary process.

Trials which have been very carefully conducted by the patentee at the "Almond Iron Works," Falkirk, and which have extended over a period of 13 months, show that with average charges of 3 tons 4 cwt. of coal, the average time from charge to discharge with the patent blast oven was 62 hours. To coke the same coal in the ordinary way 80 hours were required. The time varies somewhat according to the nature of the coal, but in all cases the advantage was much in favor of the Aitken process. It was clearly established that 20 ovens with the patent process would produce as much coke as 100 ordinary ovens in the same period of time.

It is almost universally admitted that the "Beehive" oven produces the best quality of coke. The serious drawback under which it labors is that however carefully managed the yield is very much less than the amount of carbon theoretically contained in the coal, in some cases 20 per cent. of carbon being destroyed by oxidation. To make the "Beehive" oven produce within 2 or 4 per cent. of the actual quantity of coke contained in the coal is the aim, and proved result of this patent, as may be seen from the following table. These results were obtained by working an ordinary Beehive oven fitted with Mr. Aitken's patent, and the different coals specified are compared with the yield with retorts. In the retort no oxidation of the fixed or the solid carbon can take place, and consequently the whole is retained:

Description of Coal.	Total weight of Coke in Coal as determined by Retort, Beehive included.	Average yield by Aitken's Patent Process, free from Beehive.	Difference between Retort and Aitken's Patent Process.
Blackbraes Semi-Coking Coal, free from breeze, 17 charges consecutively.....	66.45%	65.27%	1.18%
Wendle Iron Comp'y, Head Hill or Medburn Coal, 19 charges consecutively.....	73.94%	69.46%	4.48%
Newtown and Thorncliffe Coal, Staffordshire, Silstone, 4 charges consecutively.....	65.63%	62.05%	3.58%
Watson's Binnhill (Scotch) Splint ground, 1 charge.....	66.32%	65.18%	1.14%
Do. Soft or Coxroad Steam ground, 2 charges consecutively.....	68.75%	65.19%	3.56%

Mr. James Henderson, No. 30 Vesey street, New York, represents the inventor in this country.

## Scientific and Technical Notes.

We learn from our French exchanges that M. Th. Foucault has invented

A NEW APPARATUS FOR RAISING WATER, in which the power is furnished by ammoniacal gas. The machine depends for its operation on the facts that water at 15° C. absorbs 743 times its volume of ammoniacal gas, and gives it off again at 60° C.; that at 100° C. the tension of the vapor is seven and one-half atmospheres; that petroleum and ammoniacal gas are without action upon each other; and that the same is true of petroleum and water. The apparatus consists substantially of

a heater which is partially filled with a strong aqueous solution of ammoniacal gas. This heater is connected by pipe with the upper part of a closed reservoir, the lower part of the reservoir being connected by means of pipe and suitable valves with the stream or well from which and the tank to which water is to be raised. The reservoir contains a small quantity of petroleum, which forms a thin stratum on the surface of the water, and serves to keep the ammoniacal gas from contact with it, and, as the inventor expresses it, forms a fluid piston. The operation is as follows: Supposing the reservoir full of water, the temperature of the heater is raised by suitable means; ammoniacal gas is given off, and passes over into the upper part of the reservoir, the stratum of petroleum preventing its being absorbed by the water there. A pressure is thus created in the reservoir, which forces the water there out and up to the tank to be filled. When all the water has been forced out of the reservoir, the heater is cooled by removing the fire and allowing a jet of water from the tank to play on it. The water in the heater as it cools reabsorbs the ammoniacal gas from the reservoir, and thus creates a vacuum, which the water from the stream or well rushes up to fill, and thus refills the reservoir. The heater is then again heated, and so on, as before. The inventor claims that the consumption of fuel is almost insignificant as compared with that of

slowness of the workmen at either end of the pipe in unfastening the rivets, it was nearly 10:30 o'clock before the pipe was ready to lower. In the meantime a new complication arose, which threatened serious consequences. The sun's warm rays falling on a rigid exposed pipe 1000 feet long, threatened its expansion several inches, which, had it happened, would probably have necessitated the severance of the pipe. However, the preliminary work was rushed through, and 25 of the most intelligent workmen were selected to work the screws and lower the main. The circuit of the lever was marked off in quarters—one, two, three, four—and at each signal from a trumpeter stationed at the lower end, and directed by the engineer of the company, Herman Schussler, the workmen simultaneously made a quarter of the circle and then called out the number. This operation was one requiring the utmost caution, as the difference of a turn or two of the screws between any of the workmen would so unequally distribute the strain as to break the pipe. In 50 minutes, but not until the bugler had blown himself sick, and had to be placed on the retired list, the main rested in its bed, the ends were riveted, the water turned into the pipe, and the feat accomplished. Sunday was selected by Mr. Schussler for the work, as on that day there is less water used than on week days. The average daily consumption of water in San Francisco is 14,000,000 gallons, but on

behaved equally well if the attempt to unload it had been made.

On a recently constructed railway and foot bridge in England it was found necessary to

## DEADEN THE NOISE OF TRAINS.

In order to add to the convenience and comfort of the street traffic under the bridge a layer of tan 9 inches thick, upon which screened ballast was laid to the same depth, has been placed on the floor of the bridge under the permanent way. This has the effect of deadening the sound of the passing trains to a very considerable extent. The entire floor of the bridge has also been paved over with a layer of asphalt in order to prevent the percolation of rain water, which is carried off by box gutters and down pipes.

We learn from *Nature* that Dr. Janssen is devising the construction of an automatic photographic revolver, which will take

## AUTOMATIC PHOTOGRAPHS OF THE SUN

every hour each day of the year, from sunrise to sunset. The photographs which will be taken under cloudy conditions being useless so far as "sun spots" are concerned, will be utilized for meteorological purposes, the others being kept and tabulated. The advantage of the plan is that it will dispense with an observer, and will obtain a mechanical regularity. A communication will be made very shortly to the Academy of Sciences on the invention, which was suggested by the discussion on the

to an English fleet which forced the passage of the Dardanelles in 1807, for on that occasion 8 vessels were struck and nearly 100 men killed and wounded. This, it is said, was the last time they were used in action, and the replacement of them now by Krupp guns shows that the Turks have no longer any faith in the giants. For some years past their number on the shore of the Dardanelles has been growing less, and a little while ago one was presented as a specimen to the British government. When Bishop Pococke visited the spot in 1740 there were, it seems, 42 in all of these huge weapons, and he quaintly says of them: "They are always loaded with stone ball, ready to sink any ship that would offer to pass without coming to anchor, in order to be searched; they fire likewise with ball in answer to any ship that salutes the Castle. As this does much damage where they fall, so the lands directly opposite commonly pay no rent."

In 1845 a laboratory was founded in the Paris School of Mines for making

## TRUE ANALYSES

of substances presented. Last year 767 analyses were made at this laboratory, chiefly of minerals and manures. A laboratory for the gratuitous analysis of medicines and articles of food would be a very useful institution in our American cities.

Appropos of the fact that the Sevres mosaic works are about to be opened to the public, the following

## ITEMS ABOUT MOSAIC MAKING

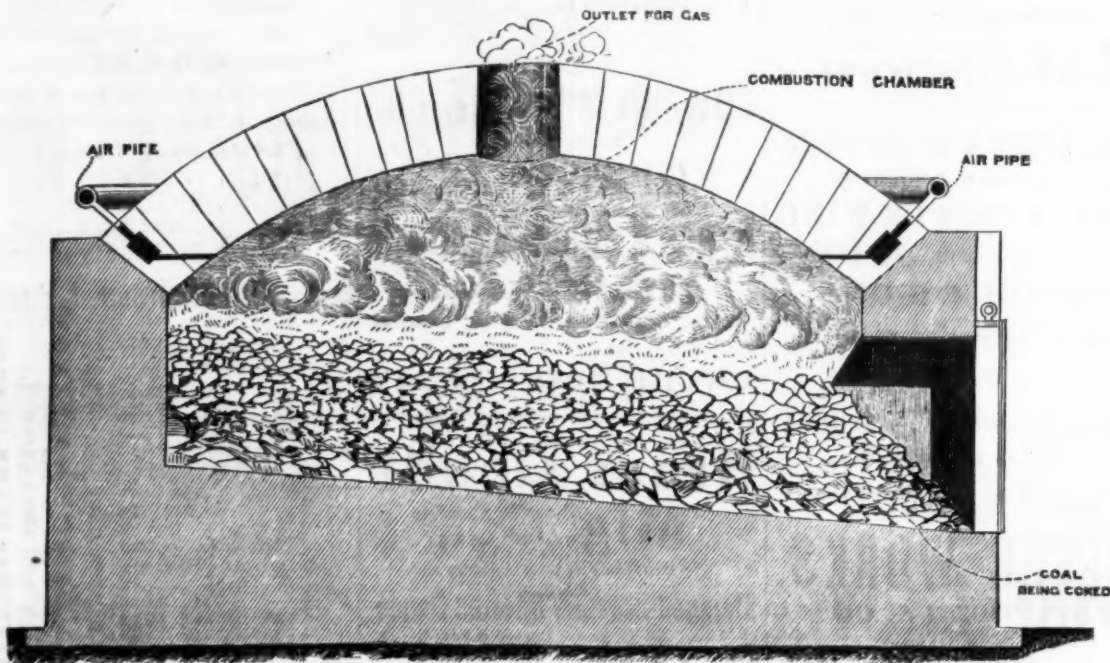
will be of interest: The art of mosaic is young in France. At Rome, where it has long been used in the reproduction of the works of old masters, no less than 10,000 different shades of enamel are kept. At the workshops in Sevres, which are not so developed as those in Rome, there are shelves and drawers fixed parallel to the walls. These drawers contain 5000 or 6000 tiny cubes of enamel or colored glass, ranged according to tint. The pattern, usually a painting, is placed before the artist, who works in a square of cement, in which he lays his cubes in shades corresponding to the design furnished him. The Roman artist works on the same plan, but instead of whole blocks of cement and enamels a centimeter square, they use microscopically small tubes, with which they have to work hard to fill up a square centimeter a day. The design is copied with a black lead pencil on a surface prepared with white plaster; this is removed little by little, and its place supplied with cement, in which the fragments of cut enamel are placed one by one. The finer the shading the smaller the cubes of enamel.

The *Scientific Press* has the following item in regard to what would seem, from the description, to resemble a well borer more than a steam shovel, as "steam diggers" are called here. In a railway excavation in Scotland, one of the machines used is a digger, invented by a Mr. Milroy, and which, after excavating to a depth of over 90 feet, struck the rock for the first time. In construction, and in the action of its various parts, the digger somewhat resembles an inverted umbrella, except that the connecting bars, representing the ribs of the umbrella, are swivelled and worked on points at either end. As affording some idea of the power of the machine at present in use in Glasgow, it may be mentioned that it can grasp within its "claws" three tons of material. It is worked by means of an engine of 16 horsepower, the chain used in the operation being no less than 345 feet in length. The cylinders themselves are immense specimens of foundry work. Around the cylinder, on the inner side, weights have been placed to the extent of 280 tons, the object of arranging this enormous mass in such a position being to provide against the probability of the adjacent ground subsiding to a degree which would be highly dangerous. Boulders weighing as much as seven or eight cwt. were brought up by the digger. The clay encountered in one part was of a consistency similar to India-rubber. This kind of material being encountered to the extent of 50 feet in depth, the difficulty of the task will be readily imagined; and it speaks well for the strength and efficiency of the digger, that it has performed its work very satisfactorily, and there has not been, as far as can be ascertained, a single inch of subsidence since the contractors first commenced operations.

We think the following interesting account of an

## OLD BOILER EXPLOSION

was originally presented in a paper to the Master Mechanics' Association: "In 1868 the writer was witness to an experiment that was tried for the purpose of ascertaining whether the injection of cold water on the crown sheet of a locomotive, after it was evident that the fluid had nearly all been converted into steam, would produce an explosion, and there were several practical machinists who held stubbornly to the theory that such a result was impossible. A temporary track was laid along the northeast slope at Kittanning Point, in Blair county, Pa., and a locomotive that had seen many years of service was run into a distance of perhaps half a mile, (Continued on page 5.)



AITKEN'S HOT AND COLD BLAST COKING OVEN.

Sundays it seldom exceeds 10,000,000 gallons. T. A. Edison, in an article in the *American Chemist*, has the following

## LABORATORY NOTES,

which are of much interest, and may be found valuable:

Hard rubber or vulcanite, placed for several weeks in nitrobenzol, becomes soft and pliable like leather, and easily broken.

The vapor of chloral hydrate is a solvent of cellulose. I have found the corks of bottles containing the crystals eaten away to the depth of a quarter of an inch, the cork being resolved into a black semi-liquid. Certain kinds of tissue paper are partially dissolved in time, if thrown in a bottle containing the crystals.

A very difficult substance to dissolve is gum copal. I have found that aniline oil dissolves it with great facility.

Hyposulphite of soda is apparently soluble to a considerable extent in spirits of turpentine. Large crystals of "hypo" melt down to a liquid after several weeks, and if the bottle be shaken, partially disappear. The turpentine smell nearly disappears.

The vapors of iodine, in the course of several months, will penetrate deeply into lumps of beeswax.

If to a solution of bisulphide of carbon there be added twice its bulk of potassic hydrate in sticks, and the bottle be well sealed, the whole will, in two months, become an intense reddish, syrupy liquid, with scarcely any free bisulphide of carbon.

At some recent artillery experiments in England the following novel method of

## DRAWING THE CHARGE OF A SHELL

was employed: Four hundred and one rounds were fired during the experiments. At the close, one live shell (a shell that was fired, but did not explode), a 180 pounder—lay on the beach. To deprive it of any power of mischief by any attempt to unload it, a small 4 ounce charge of gun cotton was placed on top of the shell and exploded, cracking the shell without exploding the powder within; the operation of breaking the shell being efficacious, and certainly very prudent. We fancy a shell so dignified in its behavior under the circumstances would have

transit of "Vulcan." When completed, it is proposed to set the instrument at work in the physical observatory of Dr. Janssen.

While the Russians are strengthening their works at Odessa with Krupp guns, the Turks are, it seems, substituting the same modern weapons for the big cannon which for ages past have watched the Straits of the Dardanelles. Bigger than the biggest "Woolwich Infant," or the 100 ton gun of the Italians, these ancient cannon still retain their former position as

## OLD GIANTS OF ORDNANCE.

the caliber of the largest being something like 29 inches, while, as our readers may remember, that of the Anglo-Italian weapon is but 17. According to one of the best authorities on the subject, Major General Lefroy, R. A., the present governor of Bermuda, these monster cannon were cast as long ago as the fifteenth and sixteenth centuries, and are fashioned entirely of bronze. The cannon balls provided are of stone, and far from being useless and unmanageable as one might well suppose such gigantic firearms to be, they have, it appears, several times been made use of with considerable effect. Some of the weapons were employed against Scutari, in Albania, by Muhammad II, in 1478, and we are told that during the siege of that place, from June 22 to July 21, no fewer than 2534 huge cannon balls were hurled against the town. As General Lefroy has remarked, in his interesting history of these guns, the supply of powder necessary to have carried on such a terrible bombardment must have been immense, while the quarrying and cutting of so many monster stone projectiles is a task scarcely to be realized in these days. Travelers have given strange accounts of the guns, whose ugly black muzzles are to be seen from the Straits, and marvelous legends are told as to their terrible might and distant range. Admiral Slade found that some of the smaller of these guns mounted on shipboard had a very respectable range with their granite balls, if the charge of powder was not too heavy, otherwise the ball was likely to break up in the gun and produce the effect of shrapnell. The larger guns are mounted on shore and not fitted with properly traversing carriages, yet they certainly did some damage



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SEE PAGE 9.

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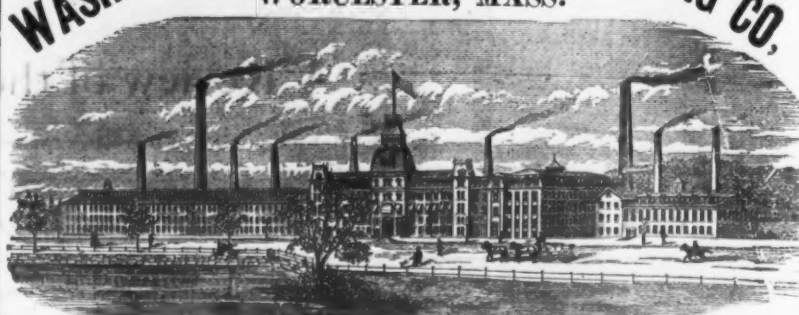
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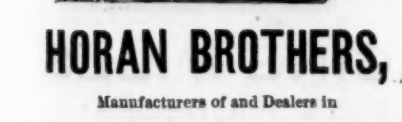
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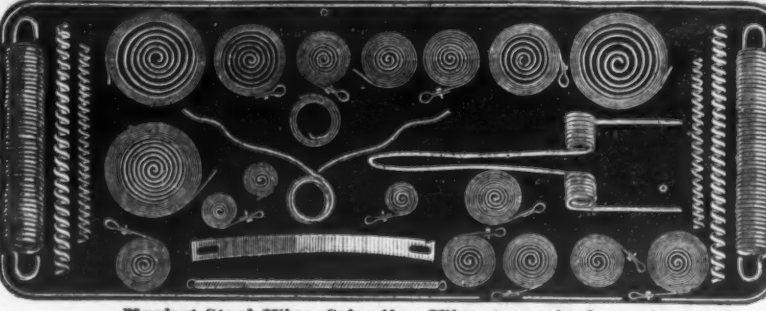
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Mr. Dillwyn Smith, No. 18 South Sixth street, Philadelphia, is the inventor of a very useful device known as an automatic stoker. In the firing of furnaces of every kind, it has been found that by the frequent addition and even distribution of fuel it is possible to so regulate the amount of air admitted that a very perfect combustion is secured, whereas with unequal and injudicious stoking it is almost, if not quite, impossible to prevent the formation of large volumes of carbonic oxide, which pass off unconsumed, as well as setting free a good deal of solid carbon, which passes off with the vapor of water as smoke. The extraordinary economy of fuel realized in some of the competitive trials of portable engines in England has been secured chiefly by good firing. Almost as great a percentage of fuel saving can be accomplished with any furnace and boiler with equal skill and judgment in firing, but the vigilance, swiftness of motion, and promptness of perception needed, make the labor very exhausting, and enables the skilled stoker to command wages so high as to reduce by a considerable percentage the economy resulting from the saving in fuel.

On page 16 of our issue of Oct. 26, 1875, we published a very complete description of the mechanical stoker, to which we refer our readers. Since that time we have the particulars of a trial made with these stokers on the English steamer *Lisbonense*, of which the following is a condensed statement:

Port.	Under Steam.	Firing.	Coal Consumed.	Cost.
Liverpool to Maranh and back.	53 d. 13 h.	By Hand.	634 tons of South Wales at 29¢.	\$189 13 0
Liverpool to Maranh and back.	32 d. 11 h.	Automatic Stoker.	619 tons Lancashire Steam, at 14¢, 87 tons of South Wales.	\$75 6 0
Saved during one voyage by Automatic Stoker.				295 5 0

The *Lisbonense* is an iron steamer of 2000 tons burden, having compound engines, supplied by steam from two boilers, four furnaces; each fired fore and aft.

The two voyages compared above were made under very similar circumstances. On the voyage out, with the automatic stokers, the vessel made average speed against a fresh head wind, with only four furnaces in use instead of eight. The homeward passage was the quickest she ever made, although using but six furnaces, and showing diminished consumption of fuel compared with the voyage out. The machines on this vessel have now been in use for two years, and have not as yet needed any repair.

Since the above test was made, slack at 8 1/2 per ton has been used on the *Lisbonense*, and her owners have ordered more of their steamers to be fitted with the automatic stokers.

The value of the stoker upon steamers running in southern waters would be very great, even if the saving of fuel was not such a great inducement to put them in. During the last summer the temperature of the stoke holes of steamers in and about New York harbor was something frightful. In one ship it was reported at 130°, and temperatures of from 115° upward were reported as common. At sea in southern waters the stoke holes are described, with more truth than poetry, as floating hells. By the use of the mechanical stoker the men are relieved from working in such frightful temperatures, and an enormous gain both in boiler power and fuel is made at the same time.

**The New Nomenclature.**

The opinions we expressed respecting the proposed new nomenclature of iron and steel compounds are already being echoed by the foreign technical journals. We supposed that the new names would meet with general approval in Germany, but from a communication to the *Berg. u. Hütten. Zeitung*, of December 1st, by Dr. Adolph Smidt, of Heidelberg, we conclude that such is not the case. We translate from Dr. Smidt's paper as follows:

Turning to the names of the members, well knowing their former openly expressed opinions on this subject, we find that the advocates of the so-called "new definition" of steel were certainly in the minority. It is, therefore, not astonishing that the new definition was not fully indorsed by the resolutions of the board. But the report, nevertheless, has the appearance of a compromise between the opinions of the minority and majority.

The opinions of the new definitionists were probably, on account of international politeness, permitted to exercise a certain influence in the preliminary part of the report, but were rigidly expunged from the propositions. This explains the incongruity we find between the preamble and the resolutions. In the first, steel is defined as "a metal possessing homogeneity due to fusion," while in the latter all

iron compounds which are capable of being hardened are given the name of steel.

From the above mentioned cause arises the want of conformity observable between the preliminary part of the report and the resolutions.

1. In one of my former articles I called attention to the fact that the iron compounds, known under the name of Bessemer or Martin steel, which, excelling through their greater ductility and natural hardness, as well as their more granular texture, many other steel compounds, should certainly have some claims to the name of steel, even though they cannot be hardened or tempered, and could be easily distinguished by the addition of Bessemer or Martin steel as intermediary and indefinite iron compounds. We see from this that even if a generic name is desirable, it is by no means a necessity.

2. It has been proved that up to within a few years the word steel had a very definite meaning, which was recognized by all theorists and metallurgists; and the now reigning confusion is mostly attributable to the advocates of the new nomenclature.

The nomenclature hitherto used was much alike in the different commercial languages. If not quite the same in expression, there was a close correspondence in meaning. It has been my desire to prove in my former lecture, at great length, that a technical definition of steel, which by its exactness would prevent all disagreements and litigation, could not now be made.

3. The preamble, apparently being added as a concession to the minority, stands in direct contradiction with the propositions which follow.

Homogeneity is an expression which of late has usurped the place of the older and far better expression of granular structure. The meaning desired to be conveyed is, that fractures in different directions should show the same internal structure, which is far better expressed by the word granular than by homogeneous; the latter term, as commonly used, designates a body which in each and every one of its fractures shows a uniform composition, yet the different fractures may have a different texture. Uniform texture by no means excludes a fibrous one. A fibrous piece of wood or iron may be homogeneous. If we take a bundle of fine steel bar, so composed that we have alternately a coarse and a fine grained bar, welding the different bars together we obtain a compound which is neither homogeneous chemically, nor shows in its fracture a homogeneous texture, yet the same is undoubtedly steel. But this product is under all circumstances of a granular texture, the latter term designating more correctly, therefore, the peculiar structure of steel.

The committee in forming their propositions have gone to work with laudable caution, and the same have, on the whole, a conservative tendency.

The terms used in the first, second and fourth recommendations of the committee are based on the usual classifications of iron compounds, yet the utility of changes like the following appear very doubtful:

Wrought iron into weld iron.  
Puddle steel into weld steel.  
Cast steel into ingot steel.

Yet these new expressions, compared with that suggested in the third proposition, have their good side.

Proposition 3 embodies the principal point of the report of the commission. Fused iron compounds, which do not permit of hardening at red heat, are classified under the generic name of ingot iron, an expression quite well chosen if manufacturers or dealers could be brought to use it.

What would be gained by accepting the propositions of the commission? Would we have an exact classification of iron compounds, or an exact definition of the word "steel"? By no means. The distinction drawn between ingot iron and ingot steel is as indefinite as that which formerly existed between wrought iron and steel. The propositions offered have utterly failed to bring about a sharp and distinct classification among the iron compounds, which certainly should have been their principal aim. Disagreements and litigations would by no means be prevented by the introduction of the new terms.

In view of these facts it appears to me useless to attempt a change for the better in the existing and commonly satisfactory nomenclature of iron compounds. Such changes, if not gradually attempted, always lead to misconceptions, the effect of which nobody is able to foresee.

The fact that this commission, consisting of the most prominent authorities in this matter from six different industrial countries, have not been able to draw a sharp line of distinction between wrought iron and steel, plainly proves, if proof is needed, that this question will ever remain unsolved.

For the earnest attempt, however, and it is hoped for the final rejection of the so-called new nomenclature, the international commission, as well as the American Institute of Mining Engineers, will merit the warmest thanks of all interested in the matter.

*Punch's* plan to prevent accidents was to tie a director on the locomotive, but it must be modified to fit the latest case. A brakeman, who has been arrested on a charge of manslaughter, testifies that the negligence which brought on an accident and loss of life resulted from his having had no sleep to speak of for a week, his last trip having been 23 hours long. He had not taken off his clothes for seven days. *Punch's* plan might be enlarged so as to keep the director awake as long as the brakeman is awake, and to keep the director's clothes on as long as the brakeman's clothes. This would make all things even and save life.



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NEW YORK.	NEW YORK.	NEW YORK.	NEW YORK.	PITTSBURGH.
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<b>Wm. Borden,</b> <b>L. N. Lovell,</b> <b>Wm. H. WALLACE &amp; CO.,</b> <b>IRON MERCHANTS</b> Cor. Albany & Washington Sts., NEW YORK CITY. <b>Wm. H. WALLACE.</b> <b>Wm. BISHAM</b> <b>SOUTHERN HOLLOW WARE,</b> Manufactured by <b>JESUP &amp; STERLING,</b> (Successors to Blackwell & Hurr.) & 9 Cliff Street, (near John), New York. proprietors <b>POCASSET IRON WORKS,</b> established 1824. Agents <b>HARRISBURG NAIL WORKS.</b> rod and steel, Railroad Supplies, Burden's Horse Shoes, Grindstones, Emerys, Tinned and Plain Ware.	<b>THOMAS J. POPE &amp; BRO.</b> <b>BORAX</b> Of Finest Qualities. <b>Mt. TALS.</b> 292 Pearl Street, near Beckman, N. Y. Anthracite, Charcoal and Scotch Pig Irons, Ingot Copper, Lead, Bi-muth, Tin, Antimony, Aluminum, Spelter, Nickel, &c., &c. <b>GRATE</b> <b>BAR</b> <b>"ECONOMY."</b> <b>GEO. VANDERBILT, Sole Agent.</b> Especially adapted for burning Pea Coal, Pea and Dust, and other fine material. Office, East West 19th Street, New York.	<b>SPENCER &amp; UNDERHILL,</b> 54 Beckman St., N. Y., Agents for <b>American Screw Co.,</b> Wood Screws, Hand Rail Screws, Stove Bolts, &c. <b>O. Ames &amp; Sons,</b> Shovels, Spades and Scoops. <b>A. Field &amp; Son,</b> Tacks, Brads &c. <b>G. F. Warner &amp; Co.,</b> Metal Clamps and an as- sortment of Builders' Hardware. <b>STEEL STAMPS.</b> <b>LETTERS, FIGURES, &amp;c.,</b> Of every description and for all purposes. <b>Best Work. Lowest Prices.</b> <b>RICHARD H. ROGERS.</b> 45 Ann Street, (near), NEW YORK. <b>NAME PUNCHES.</b>	<b>BURDEN'S</b> <b>HORSE SHOES.</b> <b>"Burden Best"</b> <b>Iron</b> <b>Boiler Rivets.</b> Burden Iron Works, H. Burden & Sons Troy, N. Y.	<b>THE PASSAIC ROLLING MILL CO.,</b> Manufacturers of <b>BEAMS, CHANNELS, ANGLES, TEES,</b> And other shapes of iron used in construction of Buildings and Bridges. Contracts made for the materials and erection of all classes of iron work and estimates, plans and specifications furnished under charge of competent engineers. <b>WATTS COOKE, President.</b> <b>W. O. FAYERWEATHER, Treasurer.</b> <b>NEW YORK OFFICE, No. 138 Chambers Street.</b> <b>Paterson, N. J.</b> <b>BAEDER, ADAMSON &amp; CO.</b> Manufacturers of <b>SAND &amp; EMERY PAPER &amp; EMERY CLOTH.</b> (Also, in Rolls for machine work.) <b>Ground Emery, Corundum &amp; Flint, Glue &amp; Curled Hair, Hair Felt, &amp; Felt-</b> <b>ing for Covering Boilers, Pipes, &amp;c., Cow Hide Whips.</b> <b>STORES:</b> <b>PHILADELPHIA, 730 Market St.</b> <b>BOSTON, 143 Milk St.</b> <b>NEW YORK, 67 Beckman St.</b> <b>CHICAGO, 152 Lake St.</b>



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(Continued from page 1.)

**Scientific and Technical Notes.**

where the test was to be made. In the furnace a roaring fire was built, and a large number of interested gentlemen retired to the safe side of the filling at Horseshoe Bend, where such as were in possession of field glasses could see plainly the indicator or steam gauge. The hand on the dial moved slowly around until an immense pressure of steam was visible, and it was concluded beyond a doubt that the crown sheet must be red-hot, while at the same time a terrible volume of compressed steam was in the boiler. Then came the moment when practical test was to be made. A steam engine had been brought up from Altoona, and a hose connection made in such way as to force water into the boiler at the proper time—the bluff sheltering those who were operating the machine, so that no casualty might happen. At a given signal the injection was made, but no explosion followed, and the hand on the dial plate rapidly receded until not a pound of steam was visible. This was the result of the first experiment, and the theorists who did not believe in explosions from this cause considered it a vindication of their ideas. But a second attempt was made a few days later to explode the same boiler under the same circumstances. As the indicator moved around the interest became intense, but just as what was considered the proper pressure was arrived at there came a terrific noise, and a chaotic mass of iron went whirling through the air. The frame work and running gear of the locomotive were thrown down the embankment some 60 feet, while portions of the dome and boiler have not been found to this day. It was an interesting experiment, but, substantially, it proved nothing.

The New York Central Railroad Company have lately built at the foot of 16th street, North River, in this city,

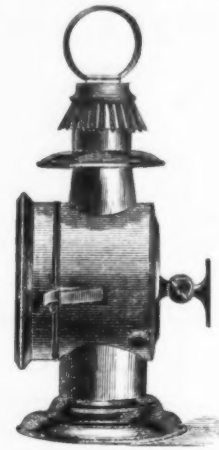
A GREAT GRAIN ELEVATOR,  
which possesses many features of general interest. It contains 286 bins for grain, varying in capacity from 1500 to 8000 bushels; total capacity, 1,500,000 bushels. It has 20 lifting elevators, each capable of hoisting 100 bushels per minute, and can unload a car from 3½ to 4 minutes. There are three tracks extending the whole length of the building, each holding 11 cars without uncoupling. Each car will stand opposite an elevator. The capacity of the cars is for wheat 450; for corn, 500, and for oats, 800 bushels. The grain will pass from the car to the weighing room at the top of the building, and each car load will be weighed at one draught. It is spouted from the weighing hopper direct to bin. From the bin it is spouted for shipment to one of the elevators, carried to the top of the building, reweighed, renovated, if necessary, and then passes directly into the ship, barge, bags or cars, as may be required. The motive power is supplied by two double acting engines of 300 horse-power each. They are supplied with the Gruebler cut-off. The foundation of the building rests upon 5500 immense piles, varying in length from 70 to 90 feet. From these are laid three courses of timber two feet thick, and upon these a solid granite wall, with a solid granite pier under each support. From the timber foundation to the support of the main wall is ten feet. The main wall is two feet thick, of brick, laid in cement, and carried up 27 feet. At the height of 16 feet there is a floor. On this floor all of the city work of the elevator will be done. There are numerous conveyors for carrying for bags to either side of the building, and all the bagging will be done here. Seven feet above this floor is the second floor, which forms the bottom of the large grain bins. These vary in depth from 60 to 70 feet. Surmounting these bins is the tower of the main building, containing all the machinery. There are 22 18-ton scales connected with the weighing hoppers, cleaning apparatus, etc. Each elevator is independent of the rest, and can be stopped and started at will by the operator. Each has its fire apparatus complete. In all, there are in the building over two miles of spouts for leading the grain to the different bins and to the boats. It is calculated that some six or seven boats may be loaded at once, the receiving and delivering capacity being estimated at 33,000 bushels per hour. The shafting to which the elevators are geared is in the upper story of the tower, and is in continuous lengths of 350 feet, one on each side of the building. There are speaking and dispatch tubes to the top of the tower, and also a passenger elevator for the whole height of the building. The working of this building has been entrusted to Mr. George J. Whitney, who has leased it from the railroad company.

A Russian engineer has made some interesting

EXPERIMENTS IN STEEL MANUFACTURE which are said to be important. Mr. Chernoff, the gentleman in question, published lately at St. Petersburg a pamphlet on the whole subject, and Mr. Anderson, of the Erith Iron Works, has ably translated it into English. The author states that "if steel melted in a crucible is constantly kept in violent agitation while cooling—agitation violent enough to keep all its particles in motion—then the cold ingot produced will have a very finely crystallized structure; if, on the other hand, the steel is allowed to cool in perfect quiet, then the resulting casting will consist of large, well developed crystals. The appearance of these crystals, and generally the tendency to crystallize under such circumstances, will depend on the purity of the steel." Starting from this remarkable, but apparently well established base, Mr. Chernoff concludes that liquid steel really obeys all the laws which regulate the crystallization of fluids. It is probable that chemists, at least, will agree to the truth of this deduction, for they know that if they wish to obtain crystals from a solution the latter must be kept

in perfect quiet. The author of the pamphlet asserts, too, that in the course of his long continued series of experiments he has discovered that steel, when heated above a certain temperature, as to a dark cherry red, loses its crystalline structure and becomes amorphous. If, again, from this point it be allowed to cool undisturbed, it will become once more crystalline, unless it be hammered during the evolution of heat from it, when its fracture will exhibit its amorphous tendencies once more, and present a fine silky texture. We commend these facts of Mr. Chernoff to the notice of the steel makers generally of this country. From that gentleman's statements it appears that he has devoted many years of studious labor to an elucidation of the numerous occult causes which have rendered steel so difficult a substance to deal with, and it is certain that his exertions have not been misapplied.

The lamp which we illustrate herewith is one recently got up by the White Manufacturing Co., of Bridgeport, Conn., and is intended for lighting mills, stables, mines, and all such work where a powerful light is required. Very lately 50 of these lamps have been sent to New Orleans to be used in lighting up the levees. The lamp is intended to burn kerosene with a chimney, and is provided with a fountain burner, so that the burner always has an even supply of oil, which is essential in obtaining a steady, brilliant light. A great many of these



lamps have been sold for use in mining lead and coal, and many of them are used in the mines of Utah. They have been found very serviceable on street and other railways.

By adapting this lamp to the use of lively carriages a want has been supplied which has long been felt but never before, we believe, been supplied. The company also manufacture dark and hunting lamps, which are very popular on account of their satisfactory operation. Fire engine and hose carriage lamps and lanterns are also manufactured by them, and have a very good record, being in use in almost every large city in America. The illustration shows a side view of the lantern, together with the clamp for holding it.

**Cornelius Vanderbilt.**

The venerable Commodore Vanderbilt died at his residence in this city on the 3d instant. As is well known, he has been ailing for some time past with a complication of complaints, which finally took the form of general debility. The fatal result, therefore, was not wholly unexpected by his family and attending physicians. He remained perfectly conscious to the last moment of his life, and died almost without a struggle. At 4 o'clock Thursday morning his condition became rapidly worse, and he expressed a desire to see the Rev. Dr. Deems, his spiritual adviser. The latter arrived in a few minutes, and Commodore Vanderbilt said, "I think I am nearly gone, Doctor." Dr. Deems prayed by the bedside of the dying man, and then some members of the family who were present sang a few hymns in low tones. The music seemed to soothe the sufferer. All his family were sent for during the night, and when he died they were by his bedside. His eldest son, William H. Vanderbilt, arrived soon after midnight, and remained to the end. All his daughters were present, and his wife, who has been present by his bedside during the entire period of his sickness, was at her post, as usual. Doctors Lindsley and Eliott were also in attendance. They warned both Commodore Vanderbilt and his friends to expect the worst. The news of his death spread rapidly, and the members of his family who were not present were at once informed by telegraph of the sad intelligence. Very many friends called at the house during the morning and sympathized with the mourners. Cornelius Vanderbilt, Jr., arrived just before his father died. The funeral took place on Sunday morning, at 10:30 o'clock.

Deceased was born on Staten Island, N. Y., May 27, 1794. His father having established a ferry between New York and Staten Island, young Cornelius had much to do with its management. For some five years he was engaged as boatman, carrying pleasure parties to picnics, boarding ships, &c.; no matter how it blew, or stormed, or froze, if "Cornell" had agreed to board a ship or deliver a dispatch, he did it. When about 16 years of age, he became the owner of a boat and commenced an independent career, and by the time he was 18 he found himself part owner and captain of one of the largest frigates in the harbor. During the war of 1812, he rendered material service in furnishing supplies, by night, to the forts about New York. In fact, his energy, skill and daring became so well known, and his word, when he gave it, could be relied upon so implicitly that "Cornell, the boatman," as he was familiarly called, was sought after far and near when an expedition particularly hazardous or important was to be undertaken. As boat-

man, at the age of 23, he was making \$4000 a year, but perceiving steam would ere long become the great agent of navigation, he in 1817 entered the service of Thomas Gibbons, then proprietor of a line of steamboats running between New York and Philadelphia, remaining in his employ 12 years. Having made himself thoroughly acquainted with the details and practical management of steam navigation, he in 1829 left the employ of Mr. Gibbons and set himself to work establishing steamboat lines on the Hudson River, the Sound and elsewhere, in opposition to corporations and companies who, having a monopoly of trade, made travel too expensive to be enjoyed by the many. His plan was always to build better and faster boats than his competitors, to run them at their lowest paying rates, and thus furnish passengers with the best and cheapest accommodations. For the next 20 years he applied himself to the work before him with the same wisdom, and that earnest, steadfast zeal he had ever shown, and was eminently successful. In 1849 he obtained a grant from the Nicaraguan government to construct a ship canal from the Atlantic to the Pacific, by the San Juan River and Lake Nicaragua, but after spending considerable money in this enterprise it was abandoned, and the Nicaragua Transit Company was organized and Mr. Vanderbilt was chosen president. Under his management this route to California became a favorite one, and the price of passage was reduced from \$600 to \$300. In 1853 he sold out his interest, and in 1855 established an independent line to Havre. The famous steamboat "Vanderbilt" was built for this line, and made the quickest time on record. Mr. Vanderbilt made a free gift of this splendid vessel to the United States government in 1862, at a time when the administration needed immediately a large addition to the navy. In 1865 he sold out all his vessels and transferred the greater part of his wealth to railroads, and he subsequently became the largest railroad proprietor in the United States. It was never his plan to put away money in a chest, nor yet to simply invest it, but rather, in the fullest sense of the word, to use it. Consequently, it is said, he employed more men, directly and indirectly, than any other man in the land.

By those most familiar with Mr. Vanderbilt's operations, and who have been intimately connected with him socially, his principal investments in securities are estimated as follows:

N. Y. Central and Hudson River stock	\$55,000,000
" " bonds	10,000,000
Lake Shore and Mich. Southern " stock	7,000,000
40,000 shares, say	2,000,000
Western Union Tel. stock and bonds	3,000,000
Harlem Railroad stock and bonds	6,000,000
N. Y. and New Haven Railroad stock	250,000
Canada Southern Railroad bonds, estimated value	2,000,000
	\$85,450,000

Beside this property, Mr. Vanderbilt owned a considerable amount of real estate. In this city his house in East Washington Place is estimated to be worth about \$48,000; and his office, stable and adjoining houses on Fourth street, comprising four tenements, \$51,000. His other city property is situated and valued as follows: Bowling Green, \$27,000; Courtlandt street, \$32,000; Twenty-second street, \$18,000. Mr. Vanderbilt has been also credited with owning what is now known as Gilmore's Garden, the Hippodrome property on Fourth avenue, but it is assessed in the name of the Harlem Railroad Company. His personal estate for 1876 was assessed at \$3,000,000. On Staten Island he owns a park and hotel worth \$200,000, and several thousand acres of wild land situated on the line of the railroad back of the old village of Clifton. This property occupies one of the most desirable positions on Staten Island, and its neglected condition, owing to the fact that Vanderbilt would neither sell nor allow any improvement to be made on it, has greatly interfered with the prosperity of the neighborhood. The Church of the Strangers (Dr. Deems') is worth \$50,000. Dr. Deems has a life lease of it, but on his death it will revert to the Vanderbilt estate, unless other provision is made in his will.

**Walrus Hide Belting.**—Mr. Joseph March, of Leeds, England, has a large factory for the manufacture of walrus hide belting. It is stated that this belting cannot be equaled by any yet introduced for strength and durability for heavy work when used upon large drums such as main driving. The thickness of the walrus hide is from half inch to 1½ inches, so that belts of that substance can be made of all solid leather, and the fibers thereof being longer than any other hide used in strap making, it is remarkably tough and lasting. There are walrus hide belts in this country which are still running, and which have been in constant use as main driving belts in forges, saw mills and other large works for 15, 18 and 20 years, yet they are in good running order, and giving the utmost satisfaction. It is frequently observed that in ordinary double belting a great strain takes place on the outside lap of the belt, which, of course, cannot be the case with the walrus hide belt, owing to its being of one thickness only. It is remarked, moreover, that they run very slack, and do not require to be worked tight as some belts do; indeed, the bite on the drum is marvelous. For example, a 14 inch belt 90 feet long will drive 100 horsepower with great ease. Mr. March is now having six 8 inch belts finished for a firm for main driving; they are made in lengths of from 6 feet to 9 feet, the joints being cemented and put under great pressure for 48 hours, and then sewn with half inch laces one-eighth inch thick, and riveted with extra strong copper rivets, and the last joint when in use is made with steel plates and bolts. The price is lower than that of the best double belting, and the great drawback is that walrus hides are now and then very scarce and high in price; four years ago they were 5/6 to 6/ per lb. in the rough, but there is now a better supply of them, though how long this will last cannot be determined.



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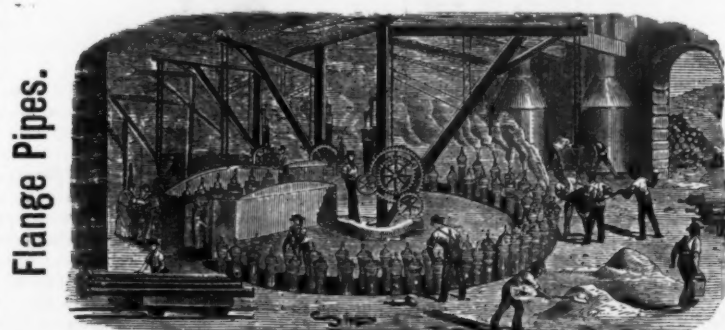
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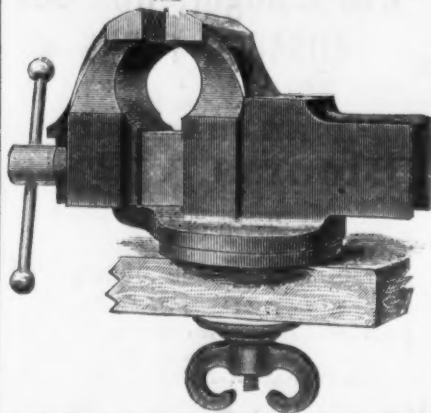
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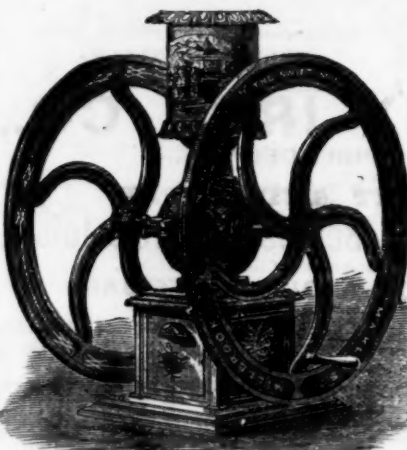
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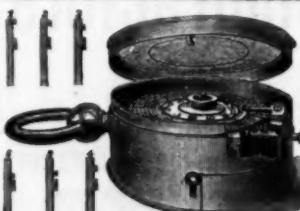
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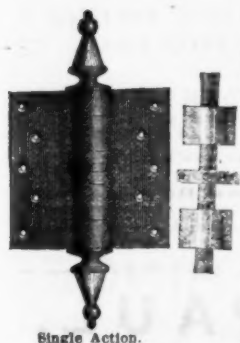
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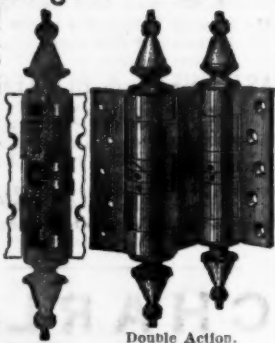
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On the 31st of January the casting house, a low modern structure, caught fire and was consumed, causing several weeks delay.

In resuming operations the blast was continued from Monday until Thursday 6 p. m., when the furnace was stopped up, and the twelve hours' make of iron left in the hearth.

The furnace kept full of stock was allowed to stand one week, and on opening was found filled up with iron to the height of the tuyeres, 2 feet 6 inches, with a mass of cinder lying above. The lump was apparently solid; no communication between the bottom of the hearth and the top of the mass could be detected. The blow-pipe fire was again applied, and a real fight with a large mass of cold iron in the bottom of a hearth was commenced. This was the first real work we had had in hand. After getting well under way we were obliged to stop for some hours on account of a leaking boiler, and to repair a slight accident to the engine. Notwithstanding these delays, and some other annoyances, the main business progressed favorably, and furnished that experience that was so much desired. Commencing at the bottom, through the tapping hole as before, the iron soon began to come away, and in a few hours we had cut a passage upward so as to obtain communication with the cinder notch. Inserting another pipe through the notch we got the lump under a cross fire, and the refractory mass began to flow away in streams under the tremendous power of the carbonyl oxygen blow-pipe fire. The work was continued, and the molten mass withdrawn as fast as it collected on the bottom. The mass outside accumulated so fast that it soon became evident that the lump must be increasing in bulk, as our pile outside was the largest. An examination of the top showed a settling down of the stock. We were not only cutting away the lump, but also meeting the new stock by means of a passage-way that had been made upward on the back side of the hearth to the right; attempts to close this passage by means of fire-clay were only partially successful. Here was a real obstacle, and the possibility of a failure became apparent. Several expedients were tried, too numerous to detail, but unsuccessful, for the lump being very hot it was determined to try if the make of new iron would not aid or complete the reduction. Having more than half of the capacity of the crucible free it was thought that the trial was worth making. It was a mistake. The application of the blast filled up the hearth again, and our last condition was not any better, if not worse, than the first. Commencing again at the bottom and working upward, again stopping up any communication formed, we had reduced a large portion of the metal when a plan suggested itself that seemed to promise entire success. The fire was withdrawn, the stoppers removed, and the tuyeres raised five inches higher, the blast turned on, and again the hearth filled up as high as the tuyeres. The tuyeres were then removed, the breast of the tuyeres (tuyere blocks) taken out, the stock stoppered back with large bales of fire-clay, and a bridge, composed of fire-clay, ground fire-brick and long cupola circulars (selected for the purpose), was built across the hearth, resting upon the lump and completely separating it from stock. The furnace was again well stoppered, and the work of reduction recommenced, applying all the power at our command. Within 48 hours the entire mass of chilled iron was removed, the bridge thrown down and taken out piecemeal through the fore hearth, and a free furnace left without shovelling out the stock or removing a brick, except as before stated. In the erection of the furnace we used for lining the hearth common cupola circulars, made of a bad quality of New Jersey clay, and from the severe usage they had received it became necessary to blow out and reline.

Subsequently the last experiment was repeated in substantially the same manner, but not on so large a scale, to determine if we were entirely right, and if any improvement in the construction of the bridge was necessary. The result was equally satisfactory, the work being performed by one keeper, a helper and one engineer. In the foregoing demonstration an effort was made to get the furnace in as bad condition as possible, in order that we might determine what could be accomplished in extreme cases, and I believe every furnaceman will say that the method followed to scaffold and bung up, and then to form a salamander of the very worst type, was as honest and severe as any that could have been adopted. The entire success resulting from determined perseverance fully warrants the announcement that a method has been found which is reliable and equal to any emergency, and that the ruinous losses that ensue in cleaning out a furnace by the old method will soon be numbered among the things of the past. To be able to prove the immediate cause of scaffolding would be a very desirable addition to our present knowledge of blast furnace phenomena. Theories, opinions and reasons are as various and as plentiful as there are foundries, managers and metallurgists to offer them, although I have examined with much interest a large portion of what has been written upon this subject, and have listened with admirable

attention and admiration to much that has been said. But none of the information obtained has been sufficiently positive and reliable to enable me to scaffold a furnace, or to cause the formation of a scaffold at pleasure.

To be sure, this may appear as a class of knowledge that one had better be without. If a furnace manager has learned how he had better forget it as soon as possible, for fear he might make use of it at the wrong time. Yet it seems sensible that while in pursuit of knowledge, and particularly knowledge that is to be based upon demonstrable proofs, that it is best to acquire all the information possible.

In course of the experiments at the Essex Furnace, in order to complete all that was undertaken, it became necessary to cause the formation of a scaffold with a fair quality of stock, such as would make good iron, with proportions and charges as fair and honest as in the pursuance of regular business, in order that the occurrence should be as near that which takes place in the accidental formation as possible.

How will you do it? This was a difficult question to answer, and the undertaking was equally difficult to accomplish. Abandoning all pretensions as to having discovered the true cause, and being in search of practical rather than theoretical knowledge, I can simply record our experience, and submit the explanation as it presented itself to us, and will leave it to the discussion and correction of able and more scientific men.

Among the many reasons given for the formation of a scaffold, I have heard it said by one, "because the furnace is too cold;" by another, "because it was too hot;" by another, "because of a change in the quality of the stock;" by another, equally wise, "because the 'devil was in it,'" and that was all the reason that could be given.

We tried for two weeks to make the furnace scaffold without chilling or bunging up, by reducing the proportion of fuel, making very hard iron and giving the little stack all the labor she could stagger under. This plan did not work. The too cold theory seemed to be at fault. We resorted to all known means to reduce the temperature as much as possible, after blowing through the cinder notch thirty minutes, and in some cases an hour at a time. The cinder was black enough and bad enough, but the stack was all clean. We then brought the temperature up by increasing the fuel and recovering our ground. We had a narrow escape from a chill, but no scaffold. We then tried this theory: A furnace scaffolds because she is too hot and is making iron too high up—not true, because a hot top is not followed by scaffolding as a general thing. This plan did not work. Try again. A furnace scaffolds because a portion of the ore is melted before it is smelted—that is, before the metal will separate from the gangue and run, and before the car-bide of iron is formed, because the stock is too coarse; the hearth and boshes too open, thereby allowing the strong currents of heat to penetrate too high, melting the ore before it is properly deoxidized and sufficiently carburized to remain liquid, and as it shifts from the hot current that caused its fusion to a cooler one, it chills instantly and adheres to the lining. The furnace is both too hot and too cold to make a fine point of it. To test this theory we adopted the following method: We screened and raked out all the small coal and fine ore. Using oyster shells for fluxing, we charged the furnace in the usual manner. Waiting until the new charge run down, we increased the speed and pressure of the blast; wetting the coal of the additional charges to keep the top cool, the result was obtained—the scaffold just at the top of the boshes where the change of direction in the lines commences. The furnace being small and low, she was disposed to work hot on top, so as to make it uncomfortable for the top fillers. Now to determine the nature of the product of ore melted with lime—that is, not smelted—with circular fire-brick we erected a small furnace five feet high, twenty-two inches in diameter, with boshes and crucible as in the large stack. After heating it properly, we charged it with ore and lime thoroughly mixed, and when well heated applied the blow-pipe flame to fuse it. The product was a heavy black, stinking mass, without the separation of an atom of iron that we could detect, chilling as soon as it left the hot flame, and in its physical aspect identical with the pieces of the scaffold that we had secured.

To relieve the furnace of the scaffold we had formed was the work of only a short time. Inserting the blow pipe underneath, it soon began to give way, and in a few hours the furnace was all clear again and put to regular work. It might have been desirable to have continued these investigations further, but the acquisition of this class of knowledge is expensive, and as we had succeeded in the formation and had obtained the requisite practice in removing a scaffold, we had accomplished all that was desired for present purposes, and regarding the successful treatment as the important object to be sought for, we leave the causes for the investigation of others.

The presentation of tangible philosophical dogmas has not appeared as important as the discovery of a positive, a reliable, speedy, effectual course of treatment that will perform in a few hours what generally consumes weeks to accomplish. To remedy with a few dollars what oftentimes costs thousands has been the real object for which we have labored, and it is neither egotism nor presumption in us to assert that we have been most eminently successful. In the experimental practice, continued for a period of nine months at the furnace, we have fully tested the ability to furnish the relief required in every variety of trouble that a blast furnace encounters in the regular process of smelting ores; that when evidences present themselves that a change for

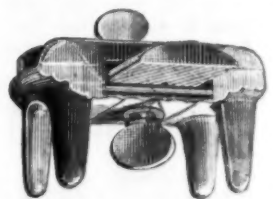
the worse is taking place, indicating trouble, a change in the grade of the iron, loss of time, loss of money, that the danger can be arrested at once without jeopardizing the safety of or injury to the stack or its contents. We have repeated this demonstration time and again, to be sure there was no source for error or possibility of failure, and have found that a change for the better can be made apparent in any size furnace that is working cold in 20 minutes, manifested by an increased brightness, brilliancy of the tuyeres, and by an improvement in the appearance of the cinder if there is enough in the hearth to flow. This improvement is effected by increasing the temperature of the hearth, adding the heat generated by the most powerful hot-blast that has ever yet been invented—a heat so powerful that the most refractory of all known material can be readily reduced by it; so adjustable that it may be readily applied to any part of the furnace, at the bottom of the hearth or at the extreme top, if necessary; so manageable that at pleasure its power can be varied instantly and reduced so low as to barely melt snow, or increased to the intense power required to fuse the most refractory and best made fire-brick, and so simple that it requires but a few dollars expense to apply it, and but the least possible amount of judgment to use it.

In this connection I desire to state that every effort we have made to improve the working of a furnace by forcing new fuel in at the base of the stack, through the tuyeres or otherwise, and whether in a solid, liquid or gaseous form, has been a failure, and that there is a strict chemical law that must ever prove an obstacle to its success. We have learned this by experience and after many trials to make it successful, but have found that forcing air after the hydrocarbons, either as naphtha, refined or the crude oil, has ever cooled down the stack instead of furnishing additional heat, and that its effect is worse than water in this respect. But the application of the heat generated by the combustion of these agents outside of the furnace has an entirely different effect—that by forcing in the flame and heat we obtain the most satisfactory results.

Of this phenomena undeniable proof can be shown. The philosophy of it and explanations as they appear to us, we will leave to another time. Although the original design of this innovation was to supply only a keeper or regulator for a furnace, and to place in the hands of the founder or manager (what is so desirable) a sure means of controlling and increasing the temperature of his hearth at pleasure, thereby making him a complete master of his art, and enabling him to stop the progress of an approaching trouble and to restore harmonious relations, and although its construction is such that it can be applied in a few moments, and its use discontinued in less time, yet we have extended its use and find great benefit and manifest economy in its continued employment, finding the make of iron in a given time very much increased and a resultant economy far greater than was ever anticipated.

In conclusion, we can but reiterate the statement of having obtained positive, absolute success in removing chills and scaffolding, by melting them out with heat in less than one-tenth of the time, and at less than one-tenth of the expense, when the stock is removed, the hearth displaced and the difficulty removed by cutting or blasting. Second, that an application of a portion of the same treatment will, when applied in time, arrest the progress of the evil and restore the furnace to its proper condition. Third, that in the hands of a watchful founder or manager, with the appliances in readiness, it is nearly impossible for any bad management, or bad filling, to chill or bung up a furnace, or to cause difficulties that a few hours application will not remedy.

The accompanying illustration represents a neat little tool for sharpening skates. It has a recess to secure the file, which is held in place by a thumb-screw. The file used is flat on one side, for flat bottomed skates, and half round on the other for skates which are grooved. Any kind of file, however, can be used, whether long or short, if it is only thin enough to enter the opening provided. In using a file to sharpen skates the great difficulty is to carry the file steadily so that it shall not slip down one side or the other. In order to accomplish this the sharpener has a flange and an adjustable gauge, between which the blade of the skate is held so that it cannot slip aside. The adjustable gauge enables any thickness of runner to be fitted. While any file, or a piece



of file, can be used in the tool, regular cutters are made for it which are more convenient, as they are better adapted to the work. Every skater knows how liable one is to take the edge off from a skate, and how quickly they become dull and rounded when the ice is even slightly dirty. Under such circumstances the pleasure of a day's skating is often spoiled, as a grinding establishment may not be within reach. In the country it is often impossible to get a pair of skates properly sharpened without sending them to a town or city, a matter often occupying several days. This little tool can be carried in the pocket and used to recover the edge without removing the skate from the foot. With an ordinary file it is necessary to put the skate in a vise, and even then the work is unsatisfactory unless an experienced hand does the work, while any boy with the American skate sharpener, as it is called, can sharpen his own skates. It is the invention of Wm. H. Fisher, patented February 15, 1876, and is manufactured by the American Skate Sharpener Co., Selins Grove, Pa. The Union Hardware Co., No. 120 Chambers street, are their New York agents.



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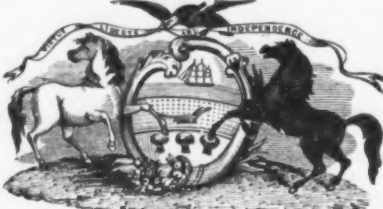
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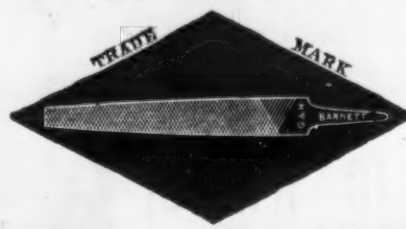
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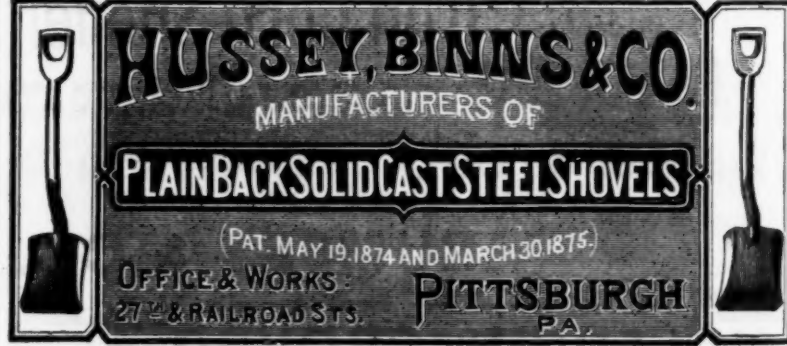
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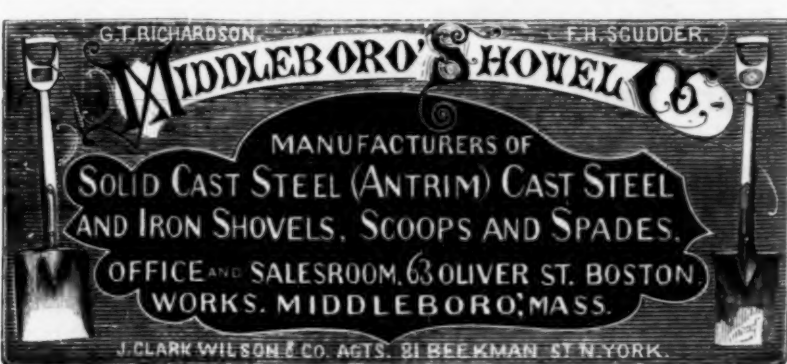
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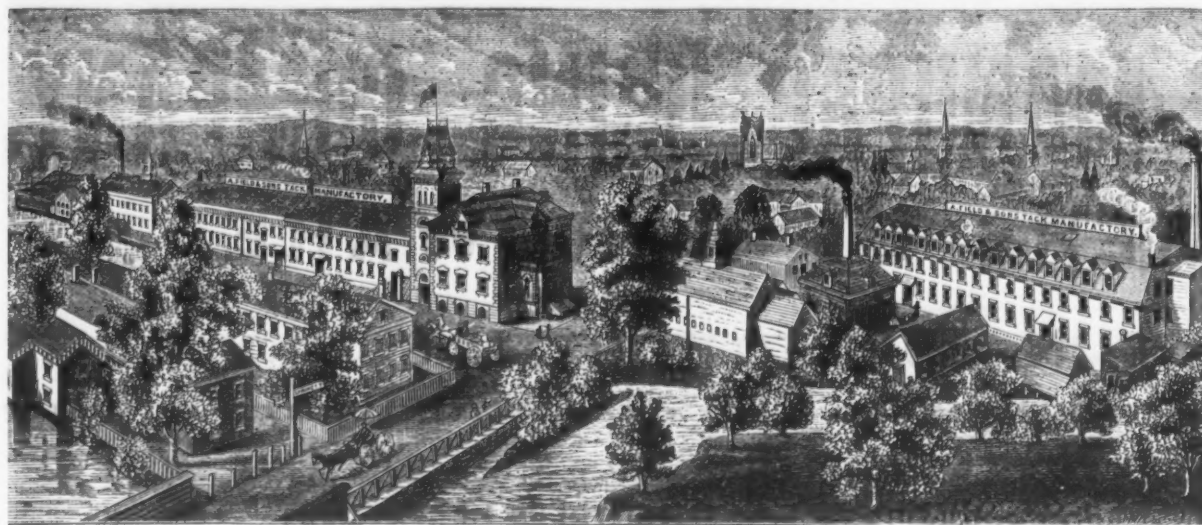
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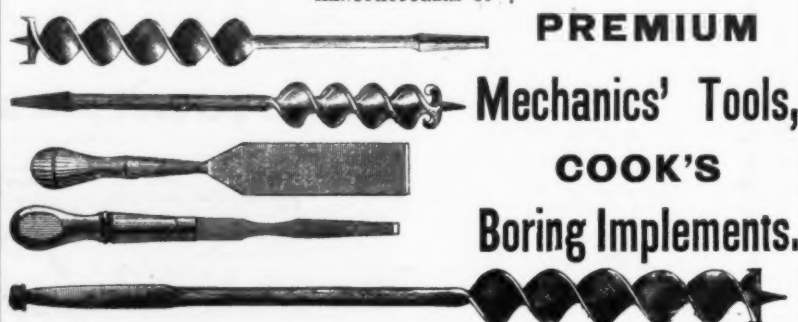
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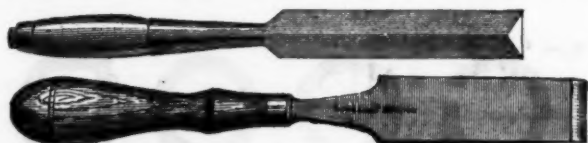
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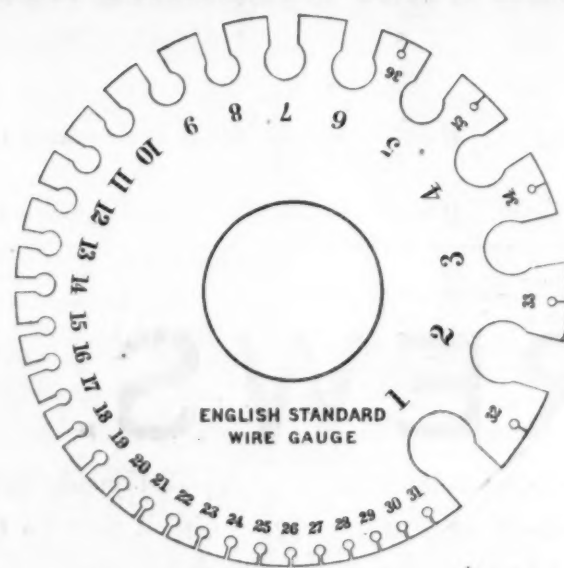
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### INDUSTRIAL ITEMS.

#### MASSACHUSETTS.

The rolling mill of the Washburn Iron Company, at Worcester, is shut down, with no immediate prospect of starting up. Work in the foundry is going on.

The rolling mill and the nail mill at Fall River have been stopped for the week, for the purpose of putting blasts in the four new furnaces.

The plate turners in the nail factories of Warcham complain that they are unable to earn more than 90 cents to \$1 per day of eleven hours.

The Lanesborough Iron Works are running on full time, and are opening new ore beds. Not once during the hard times has the 15th of the month failed to bring full pay to the workmen.

Pevy Bros., Lowell, are prepared to furnish light and heavy castings from 1 to 30 tons weight, having lately sold an anvil for a steam trip hammer weighing 29,070 pounds. They have recently increased their capacity, and employ an average force of 25 men, with a fair business outlook for the future. The shipping facilities for foundry work are excellent.

The nail factories in East Weymouth, in which business has been suspended during the summer, owing to the inadequate supply of water, have now resumed operations on full time.

All the Wareham iron mills are running full time for the first time within a year.

Hon. E. C. Howard's foundry at North Sandwich is overflowing with orders.

The Douglas Axe Company have finished a large government order.

#### RHODE ISLAND.

During the year 1876 the Providence Tool Company have paid seven per cent. interest on all their obligations, and have reduced their indebtedness \$1,500,000. To accomplish this they have not sold any fixed property or machinery. The Turkish government has arranged credits, reaching several months ahead, which will enable the company to continue their work, and the company also holds a large amount of collateral property to secure the fulfillment of the contracts upon which they are employed. The factory on Wickenden street has commenced running 13 hours, and it is expected the other factories will soon run the same number of hours. During the year this company has disbursed in the vicinity of Providence \$2,500,000, which has been received from a foreign country.

#### CONNECTICUT.

The report that the business of the Bridgeport Lock Co., of Bridgeport, is to be removed to New Britain next month is untrue, and probably was originated by the fact that the Russell & Erwin Mfg. Co., have purchased the interest of N. G. Miller in the business.

#### NEW YORK.

The Onondaga Furnace, Co., at Geddes, are running but one furnace, and will not put the other until prices are better. The one in blast is doing excellent work, making 280 tons per week of the very best foundry, which will about supply their regular customers.

Swett, Quimby & Perry, of Troy, have posted a notice upon the door of their foundry, discharging all of their employees, from the book-keeper down. All who desire to remain must make new bargains at new prices.

The Ellis Locomotive Works, of Schenectady, closed since October, have been opened with work for 400 men.

Burdett & Smith, of Troy, have entered suit against the Cleveland Co-operative Company for an alleged infringement of a stove patent; \$50,000 are involved.

The Schenectady Locomotive Works, at Troy, are now turning out two locomotives a week, upon the recent order given by the New York Central and Hudson River Railroad Company.

#### NEW JERSEY.

The Port Oran Furnace is making preparations to start.

In the suit of the Rogers Locomotive Works, of Paterson, against the St. Louis, Iron Mountain and Southern Railroad, the jury rendered a verdict for plaintiffs for the full amount claimed, \$53,000. The claim, it will be remembered, was for nine locomotives furnished in 1873. The contract had been for 10 locomotives, but after one was delivered and paid for, the railroad company refused to accept the others, the defense being that the vice-president of the railroad company had made a mistake in taking the contract. The suit was tried before Judge Larimore in the Supreme Court, Circuit, in New York city.

The Paterson Iron Works now employ about 50 men, which is a goodly number, all things considered. Those great iron hooks which were being made at the works for Hell Gate, called devil catchers, have all been completed and delivered, and by this time, no doubt, they have brought up many a big rock to the surface of the East River. They have recently turned out some very large forgings, notably the crank and shafts for the steamship Daniel Drew. These heavy weights generally bring down the scales at about 8 or 10 tons, though they had a crank or shaft for a pump not long since that was the enormous weight of about 25 tons. Work of this kind seems to be coming in as fast as it goes out, and it keeps up a busy appearance for some parts of the establishment.—Press.

The car repair shop of the Erie Road, at Newburgh, had received orders to close up on the 30th, and send all material to the Jersey City shop. It is presumed the shop will be reopened in the spring.

#### PENNSYLVANIA.

The Rosens Furnace, at Newcastle, produces sixty tons of pig iron per day, and has produced seventy-five thousand tons of iron

since it was first blown in, some forty-three months ago.

It is said that Hon. E. A. Wheeler is at present engaged in arranging for the erection of a nail factory in connection with his rolling mill at Middlesex, Mercer county. He designs putting in about 50 nail cutting machines.

The rolling mill of Reis, Brown & Berger, Newcastle, was shut down the last week in May, and consequently has been idle some seven months. There is no prospect of it starting up at present.

Glendon Iron Company are preparing their largest furnace, No. 5, for blast.

At a meeting of the directors of the Co-operative Iron and Steel Works, at Danville, held on the 29th ult., M. J. Grove was elected president and L. K. Rishel, secretary and treasurer for the ensuing year.

The daily production of the Clara Furnace, at Newcastle, is sixty tons.

The National Locomotive Works, at Connellsville, shipped an engine to Springfield, Ohio, on the 2d inst. This establishment is working full force, and now has orders for nine locomotives, which are all under construction.

Lemont Furnace Company are shipping from two to three cars of limestone per day, from Connellsville to Lemont.

The Harrisburg mills were reported last week as follows: Lochiel has been nailed up for the past six months; Paxton is closed for repairs; Bailey's was off week before last, but is on again; Hot-pot is on single, but orders are short.

The La Mothe Iron Car Works are to be removed to McKeesport from Providence, R. I.

A number of the employees of the Scott Works, at Reading, had their wages reduced twenty per cent. This is said to be owing to the general stagnation in the iron trade of the Schuylkill Valley.

The Reading Hardware Company will go into operation again in about one week, when nearly 400 hands will be employed. The capacity of the old engine is about 80 horsepower, while the new engine, which is to take its place, will be 150 horsepower. In the spring two additional brick buildings, each two stories in height, will be erected. One will be 80 by 35 feet, and will be used in finishing and bronzing certain kinds of hardware. The other will be 35 by 40 feet, and will be occupied as a carpenter and cooper shop.

The Henry Clay furnaces, Reading, are ready to blow in with some little encouragement in the way of orders.

The Temple Furnace is also preparing to blow in, having some orders.

The second Plymouth Furnace was to have blown in last week.

The Reading Rolling Mill (P. & R. C. & I. Co.) was in operation two weeks in December. They stopped over the holidays and resumed on the 2d. It is uncertain whether the mill will run continuously or not, as their orders are for March delivery.

The Hamburg Mill, which a Schuylkill county party proposed to lease, has not yet been started.

The employees in the shops of the Philadelphia and Reading Railroad Company, Reading, work one week in three weeks, eight hours a day, and in this way all are given a show.

Two furnaces, the nail factory and the rolling mill of E. & G. Brooke, at Birdsboro, are in operation.

The Bethlehem Brass Works, Shovel Works, Bessemer Works, and lesser manufacturing concerns, are busy.

The old mill of the Bethlehem Iron Company, at Bethlehem, is at present working on a two months' order for rails. The prospects for steady work at this mill are brightening.

Employees at the Pennsylvania Railroad shops at Altoona, heretofore working 8 hours a day, were to work 10 hours, commencing Monday.

The Rodman furnaces will go in blast about Feb. 1st.

The Allentown Iron Company's furnaces give no sign of going into blast. They have a large stock of iron on hand, but it is held by the stockholders as individuals.

One of the Bethlehem Iron Company's furnaces is out for repairs.

The Glendon Iron Company have coal and ore on hand, and it is rumored will start one furnace.

The Thomas Iron Company have four furnaces in blast at Hokendauqua and two at Alburtis, and will probably not put any more in blast.

#### PITTSBURGH AND VICINITY.

Notwithstanding the dullness in trade during the past year, and the low price at which coal and coke was sold in the lower markets, the forthcoming report of the Monongahela Slack-water Company will show a material increase in the shipments during the past year, compared with 1875. Through the courtesy of Mr. Will P. Wood, clerk of the company, we are enabled to give the following figures, showing the shipments from the several pools:

	No. Bushels.
Lock No. 1.....	8,913,300
Lock No. 2.....	28,428,300
Lock No. 3.....	11,367,300
Lock No. 4.....	13,625,300
Total coal.....	62,336,000
Coke from Lock No. 2.....	6,086,000
Total coal and coke.....	68,422,000

In 1875 the shipment of coal and coke aggregated 63,707,500 bushels, showing an increase during the year just closed of 4,775,500 bushels.

There seems to be quite an inquiry for light rails for narrow gauge roads in this market.

Reese, Graff & Woods are running their steel and horseshoe department double turn, turning out in the latter about 10 tons per day. In their iron mill they are doing but little.

(Continued on page 11.)



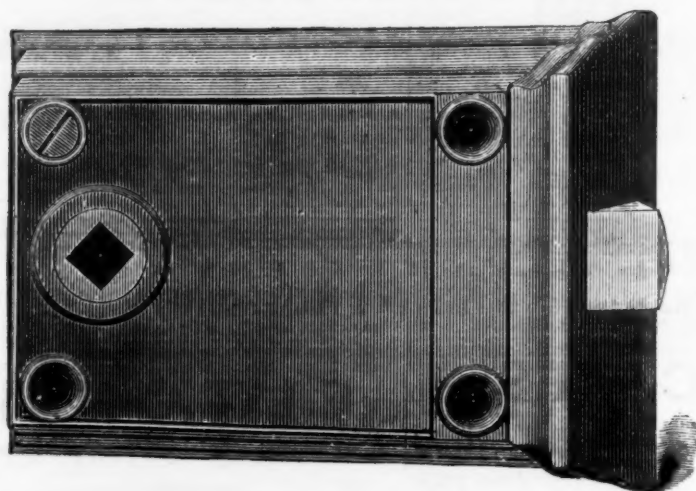
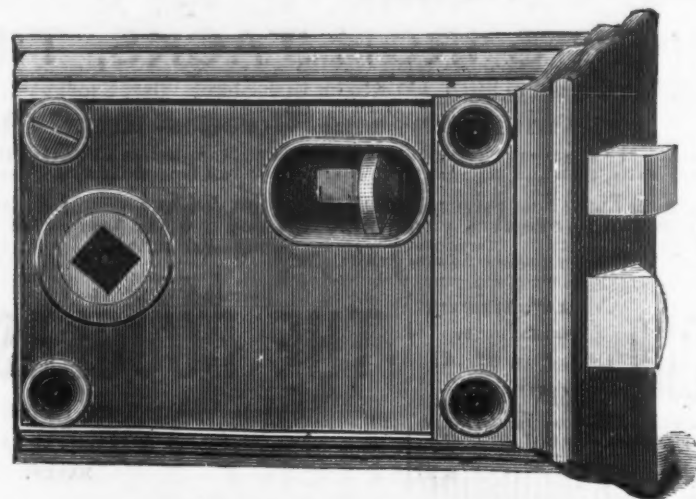
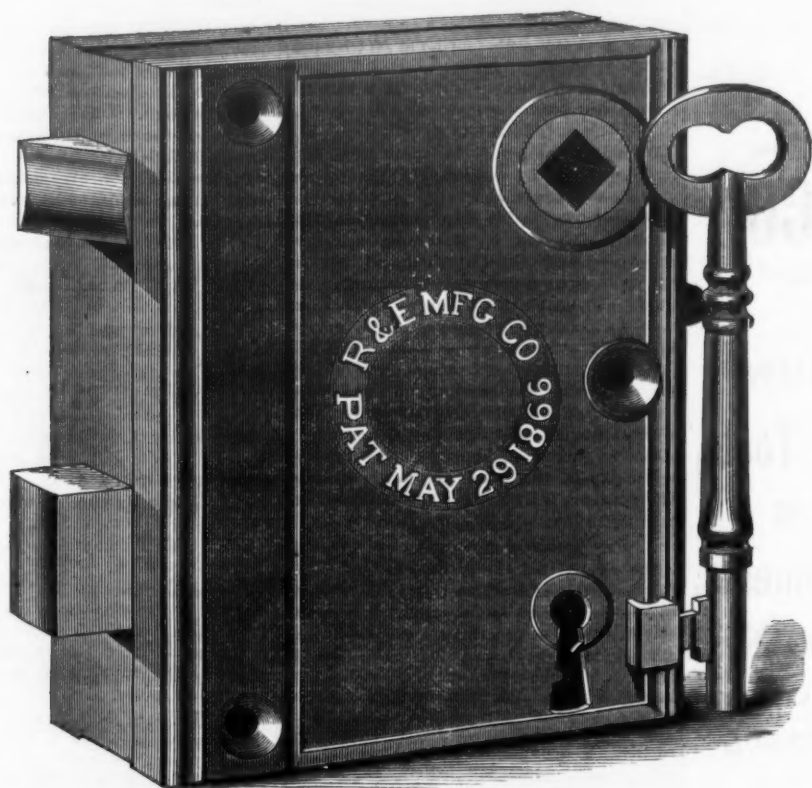
# RUSSELL & ERWIN MANUFACTURING COMPANY, MANUFACTURERS OF HARDWARE.

Factories, NEW BRITAIN, CONNECTICUT, U. S. A.

Manufacturers' Agents and Dealers in General Hardware at our  
**WAREHOUSES,**

NEW YORK, - - - Nos. 45 and 47 Chambers Street.  
PHILADELPHIA, - - - No. 425 Market Street.

SOUTHERN DEPARTMENT,  
BALTIMORE, MD., WM. H. COLE, AGENT, 17 South Charles St.



## NEW GOODS.

In consequence of the high prices established for Brass Bolt Rim Knob Locks and Latches, we have determined to place upon the market a new line of **BRASS-PLATED** goods, for which we solicit orders for immediate delivery. We shall increase our variety as occasion may require.

These goods are furnished with **BRASS-PLATED BOLTS** and **SOLID BRASS** Keys, and in make and finish are equal to our standard goods.

### HOME UPRIGHT RIM KNOB LOCKS.

PULL-OUT REVERSE.

No.	Size.		Without Knobs Per Dozen.
B 861.	4 inch.	Janus face, 2 Brass-plated Bolts, Solid Brass Key, without Stop . . . . .	\$5.00
B 861 1-2.	4 inch.	Janus face, 2 Brass-plated Bolts, Solid Brass Key, with Stop . . . . .	5.25

### HORIZONTAL RURAL KNOB LATCHES.

No.	Size.		Without Knobs Per Dozen.
B 557.	3 1-2 inch.	Brass-plated Latch Bolt . . . . .	\$4.00
B 552.	3 1-2 inch.	Brass-plated Latch and Slide Bolt . . . . .	5.00

Discounts, same as on our regular goods.

## SCREWS.

We are now turning out five thousand gross per day of Flat Head Gimlet Point Screws of unequalled quality and finish. We solicit orders for these goods, and our prices will at all times be as low as those of any standard manufacturer, and in all cases we **GUARANTEE THE QUALITY AND FINISH** of our Screws, and invite a comparison under the **SEVEREST TESTS** with any other similar manufacture.

Our Screws are all packed in our new Patent Paper Boxes, bearing our labels, on which are **LARGE FIGURES** denoting the **Size** and **Number**.



## Cutlery.

## FRIEDMANN &amp; LAUTERJUNG,

Manufacturers of **PEN AND POCKET CUTLERY**,  
Solid Steel Scissors, Shears, Razors,  
Russia Leather Straps, Hones, &c.  
Sole proprietors of the renowned full concave patent  
"ELECTRIC RAZORS,"  
And the celebrated "ELECTRIC SHEARS." Nickel Plated  
Bows.  
Agents for the **BENGALL RAZORS**.  
**AMERICAN TABLE CUTLERY, BUTCHER KNIVES, &c.**  
91 Chambers and 73 Reade Sts., N. Y. 423 N. Fifth St., ST. LOUIS, MO.

## MERIDEN CUTLERY CO.

Received the HIGHEST CENTENNIAL PRIZE.



MANUFACTURE ALL KINDS OF TABLE CUTLERY.  
Exclusive Makers of the "PATENT IVORY" or Celluloid Knife, the most durable WHITE HANDLE  
known. The Oldest Manufacturers in America. Original Makers of the **HARD RUBBER HANDLE**.  
Always call for "Trade Mark" "MERIDEN CUTLERY CO." on the blade. warranted and sold by all Dealers  
in Cutlery, and by the **MERIDEN CUTLERY CO., 49 Chambers Street, New York.**



## THE MILLER BROTHERS CUTLERY CO.

Manufacturers of  
**PATENT FINE PEN & POCKET CUTLERY**  
WEST MERIDEN, CONN.

The only Knives made that are put together in such a manner that there is no strain on the cov-  
ering or fall part of the knife. We warrant our knives equal in cutting qualities and workmanship to any  
made, and are acknowledged by English makers as the **Best American Knife**. We also make  
**NICKEL & SILVER PLATED POCKET KNIVES**  
which will not rust or become discolored when used as a Fruit Knife, and their cutting qualities are equal  
to any other knife. Orders filled from the factory, and in New York by **Messrs. J. Clark Wilson**  
& Co., No. 81 Beekman Street (who have a full stock of all patterns always on hand), and also by  
**Messrs. G. H. Walbridge & Co., No. 99 Chambers Street.**

**NAUGATUCK CUTLERY CO.,**  
Manufacturers of FINE PEN & POCKET CUTLERY.  
FULLER BROS., Sole Agents, 89 Chambers and 71 Reade Sts., N. Y.

HALL, ELTON & CO.,  
Electro Plated Ware, German Silver and Britannia Spoons.

THE "PALACE."

Factories, Wallingford, Conn.

Salesroom, 75 Chambers Street, New York.

**JOSEPH S. FISHER,**  
No. 411 Commerce St., PHILADELPHIA  
AGENT FOR

**George Wostenholm & Son,**  
"Limited."  
Washington Works, SHEFFIELD,  
Celebrated I-XL Cutlery, Razors, &c

AGENT FOR  
**WALTER SPENCER & CO.,**  
Steel and File Manufacturers,  
Rotherham, ENGLAND.

Corporate Mark  
**W. SPENCER**  
ROTHERHAM  
Granted 1777.

## VAN WART, SON &amp; CO.

Hardware Commission Merchants,  
EXPORTERS AND IMPORTERS,  
BIRMINGHAM, - ENGLAND.

**McCOY & COMPANY,**  
184 & 186 Duane Street, N. Y.  
**George H. Gray & Danforth,**  
18 India Street, Boston.  
**F. W. TILTON,**  
17 Old Levee Street, New Orleans.

At each of these places a complete assortment of sam-  
ples of Hardware and Fancy Goods will be found, in-  
cluding all new descriptions. Sole Agents for  
**John Rimmer & Son's Celebrated**  
**Harness and other Needles.**  
**W. Clark's Genuine Horse Clippers.**  
**Seydel's "Ashantee" Pocket Hammer**

**McCOY & COMPANY,**  
**BORAX A SPECIALTY,**  
134 & 136 Duane St., New York.

**F. W. HARROLD,**  
Birmingham and Sheffield,  
ENGLAND.

Importer on Commission  
OF  
**HARDWARE, CUTLERY, GUNS, &c.**

**W. SANDERS, Agent,**  
76 Reade Street, N. Y.

## CORPORATE MARK,



**Joseph Rodgers & Sons'**  
(LIMITED)

**CELEBRATED CUTLERY,**  
No. 82 Chambers Street, New York.  
**F. & W. CLATWORTHY, Agents.**  
The demand for **Joseph Rodgers & Sons'**  
productions having considerably increased, they  
have, in order to meet it, greatly extended their  
Manufacturing Premises and Steam power.  
To distinguish Articles of **Joseph Rodgers**  
& Sons' Manufacture, please to see that they bear  
their Corporate Mark.

## OWEN &amp; CAMPBELL,

Manufacturers of

## PEN AND POCKET CUTLERY.

All blades forged from the best English Cast Steel,  
and Warranted. Each knife made in the  
most substantial and compact manner, all articles  
used being of the best quality. All blades stamped  
Owen & Campbell, Philadelphia.  
Orders filled from the Factory Rear of  
220 N. Second St., PHILADELPHIA.

## Cutlery.

ESTABLISHED 1852.

## NEW YORK KNIFE CO.

MANUFACTURERS OF SUPERIOR

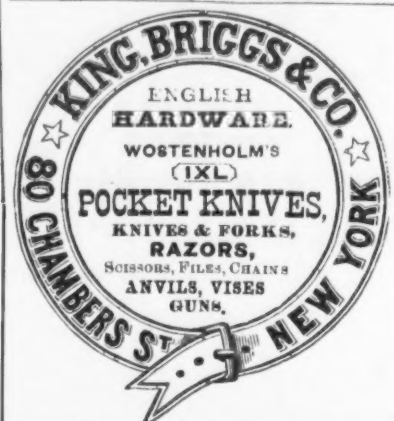
## Table &amp; Pocket Cutlery,

WARRANTED TO BE MADE OF THE BEST MATERIAL.

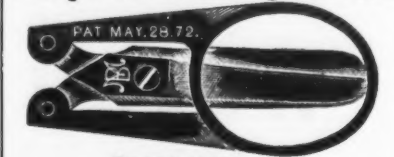
WALKILL RIVER WORKS,

Walden, Orange Co., New York.

THOS. J. BRADLEY, President.



## Young's Patent Folding Scissors.



Five styles of the small size.  
These Scissors are made of the very best steel, nickel  
plated, and so constructed that they can be readily  
folded and carried in the pocket without injury to the  
garments. A sample pair will be sent by mail, to the  
trade only, upon receipt of the retail price, namely:  
Large size, pointed or half pointed, \$1.00  
Small size, pointed or half pointed, .75  
New York, Feb. 1st, 1876.

**MAX BROS., Proprietors,**  
420 Broadway.

## CAPEWELL MFG. CO.,

Manufacturers of  
Shot Belts, Pouches, Powder Flasks,  
Powder and Shot Measures,  
WOODBURY, CONN.

Salesroom, 298 Broadway, N. Y., with LANDERS,  
FRAY & CLARK, mfrs. of Table Cutlery.

## Established 1853.

## AMERICAN SHEAR CO.

Manufacturers of  
Pen and Pocket Cutlery,  
Shears, Scissors and Pruning Shears,  
HOTCHKISSVILLE, CONN.  
Salesroom, 298 Broadway, New York, with  
LANDERS, FRAY & CLARK.

(Continued from page 9.)

## INDUSTRIAL ITEMS.

## OHIO.

Bourne & Knowles, at Cleveland, manufac-  
turers of nuts and washers, are running on  
nine hours' time; report orders in fair supply,  
and prospects rather better than for some time  
past.

The Standard Manufacturing Company,  
Cleveland, are making ten of their Domestic  
gasoline cooking stoves per week, and also  
some sixty patent steel tube scrapers.

The Cleveland Spring Works, Cleveland, are  
running on nine hours' time; business fair, and  
showing some slight signs of improvement.

The Pittsburgh and Lake Angeline Iron Com-  
pany have established an office in the Waring  
Block, at Cleveland.

The old mill and steel works, Cleveland, will  
shut down for repairs on the 20th instant.

The trial of 30,000 bushels of Sheridan coke  
at the Aina Furnace has given entire satisfac-  
tion.

There are now three mills running in Niles—  
the Falcon Iron and Nail Mill, the Niles Iron  
Co.'s Mill and the Russia Mill.

The Chillicothe Agricultural Works, at Chil-  
licothe, are in the hands of an assignee. The  
assets have been appraised at \$38,000, and an  
effort is being made to raise the capital stock  
to \$50,000, and to indemnify the stockholders.  
A meeting was held there for this purpose two  
weeks ago, but after considerable exhortation  
to citizens to do their duty, &c., adjourned  
without accomplishing anything.

About a month since we called the attention  
of manufacturers to a self-feeding nail machine  
that had been built at the foundry of Booth,  
Miller & Co., at Youngstown. Since that time  
the Koplun machine, as it is called, has been re-  
moved to the nail factory of Brown, Bonnell &  
Co., and there placed in operation. It has been  
subjected to the most severe test, and at a speed  
of 200 the feeder has cut 40 pounds of 4d. nails  
per hour. Its operations have in every way  
proved satisfactory to all interested. Another  
of the machines has been built, and is now in  
operation at Booth, Miller & Co.'s foundry.

No. 2 blast furnace, of the Cleveland Rolling  
Mill Company, at Cleveland, is now being lined.  
The furnace will probably be ready for the blast  
in about four weeks.

Newton & Cox, of Cleveland, have just re-  
ceived a large order for twist drills from Dun-  
ham, Carrigan & Co., of San Francisco.

## ILLINOIS.

Chicago is steadily growing into prominence  
as a manufacturing center for iron and steel.  
Of the Bessemer steel works in the United  
States, two are located in Chicago, and of the  
291,000 tons of Bessemer steel rails manufac-  
tured in the country last year, 85,000 tons, or  
nearly one-third of the entire quantity, were  
made in that city. The decrease in the value of  
the iron manufacture of 1876 is, according to  
the Chicago Tribune, much more perceptible in  
the minor branches than in the value of the  
rolling mill products. More iron was manufac-  
tured last year than in 1875, but the scale of  
prices was so ruinously low that sales on fair  
profits were out of the question. The cost of  
labor was about 5 per cent. lower than in 1875.  
Including the mills at Joliet and South Chicago,  
which are owned by Chicago capitalists, that  
city now has four rolling mills. About 90,000  
tons of steel rails were turned out in 1876,  
against 75,000 in 1875. The annual pay rolls of  
the mills foot up \$2,300,000, against \$2,700,000  
in 1875. Over 1100 tons of coke and coal are  
daily consumed in the process of rail and pig  
iron manufacture. The total number of estab-  
lishments in that city devoted to iron works in  
the different departments is 173, with an in-  
vested capital of \$14,800,000, giving employ-  
ment to 9175 workmen, and yielding an annual  
product of \$27,236,000. The aggregate wages  
paid during the year amounted to \$4,367,770,  
against \$5,650,837 in 1875, \$5,311,530 in 1874,  
and \$7,294,680 in 1873. Of these 173 establish-  
ments, only 26 were in existence previous to  
1860.

The Belleville Nail Works, under the official  
management of Gen. W. H. Powell, are doing  
better work than ever before. Week before  
last about 2800 kegs of nails were made, more  
than half of which were finer than 10's. A  
large percentage of old rails is used with ex-  
cellent results by a method for which Gen.  
Powell has asked for a patent.

The North Chicago Rolling Mills have con-  
tracted with several railroad companies to sup-  
ply large quantities of iron and steel equip-  
ments in the year on which we enter, so that  
the works will be run throughout the winter.  
One of these orders, from the Pittsburgh, Fort  
Wayne and Chicago Railroad, is for 4000 tons of  
steel rails.

Early in December it was stated by the  
Chicago press that the Joliet Iron and Steel  
Company, Chicago, had shut down work and  
left their 800 or 900 men out in the cold. The  
fact was, however, that on the 11th ult. they be-  
gan on new orders for several thousand tons of  
steel rails, and have finished in activity the year  
so begun and carried through.

The Keystone Manufacturing Company,  
whose works are at Rock Falls, give con-  
stant employment to 150 hands, and at no  
time since the panic of 1873 have they reduced  
their force or run on short time. They turned  
out in 1875 about \$500,000 worth of agricultural  
implements. These are the Keystone corn  
planter, sulky rakes, seed sower, cider mill,  
"common sense" feed mill and corn sheller.  
In the year just closed the company have filled  
large orders from South and Central America,  
Austria and Russia.

## INDIANA.

The Brazil Furnace is running part on Besse-  
mer and part on mill.

## KENTUCKY.

Pennsylvania Furnace, during the termina-  
tion of the 172 days she was in operation, made

a daily average of 11 37-100 tons, having made  
a total turnout of 1955 74-100 tons of No. 1  
pig iron, in the manufacture of which she  
used 1558 loads of charcoal, 5675 27-100 tons  
iron ore, and 278 10-100 tons of limestone. This  
makes a yield of one ton of iron to 159 bushels  
of charcoal and 2 90-100 tons of iron ore.

## TENNESSEE.

Truxal & Dummeyer, proprietors of the En-  
terprise Machine Works, at Chattanooga, have  
added thirty feet to the length of their shop,  
and are further increasing their capacity by a  
large new steam boiler. They are at work on a  
new vertical engine for their shops, which will  
increase their present motive power five times  
and will be the finest engine built in that city.  
The steady increase of their business has made  
these additions necessary.

## MISSOURI.

Mr. G. A. Millard has recently withdrawn  
from the firm of Geo. H. Hull & Co., of Louis-  
ville, Ky., and established himself in St. Louis,  
dealing in pig iron, fire-brick and blooms.

The St. Louis Bolt and Iron Works have  
contracted for two miles of fifteen pound rail  
for a street car road at Fort Worth, Texas.

## MICHIGAN.

The Detroit City Glass Works, at Springwells,  
are in full blast, and employ about 75 men.

The loss sustained by Codey & Clark by the  
burning of the stove factory at Belleville is  
nearly \$9000. In consequence thereof Mr.  
Codey has made an assignment.

## WYOMING.

The Laramie Iron Works were recently turn-  
ing out 60 tons of rails per day.

## COLORADO.

The foundry at Denver, which has hitherto  
been occupied entirely with mining machinery,  
is now to be greatly enlarged, and will extend  
its operations to the manufacture of engines,  
boilers, bridges and agricultural implements.

## The British Mineral Statistics.

The following are the official statistics of the  
mineral production of Great Britain in 1874 and  
1875:

Minerals.	1874. Tons.	1875. Tons.	1874. Cwt.	1875. Cwt.
Coal	135,043,257	0	131,967,105	0
Iron ore	14,844,936	10	15,811,000	3
Copper ore	78,321	0	71,536	0
Tin ore	14,039	7	13,995	10
Lead ore	76,301	12	77,746	4
Zinc ore	16,389	16	23,978	8
Iron pyrites	56,308	3	48,035	16
Arsenic	6,329	9	5,132	0
Manganese	5,775	1	3,305	11
Ochre and amber	7,122	1	5,815	13
Wolfram	32	15	46	3
Bismuth	3	10	...	...
Silver ore	3	10	...	...
Fluorapatite	634	10	358	15
Clays, porcelain	2,436,912	0	3,008,444	0
and fire-clay	0	0	2,816,644	0
Salt	2,365,547	0	15,549	5
Barites	14,574	0	...	...
Coprolites, &c., and phosphor- ite	149,654	0	250,129	0
Gypsum	56,134	0	443,336	0
Oil shales	...	...	30	0
Plumbago	...	...	...	...

Counties &c.	1874. Tons.	1875. Tons.	1874. Cwt.	1875. Cwt.
Cornwall	45,005	13	11,403	15
Devonshire	31,313	3	10,594	1
Somersetshire	41,242	7	45,165	17
Gloucestershire	171,428	0	111,825	16
Wiltshire	56,630	0	87,153	0
Oxfordshire	38,006	10	94,098	0
Leicestershire	2,980	0	...	...
Northamptonshire	1,036,478	11	1,086,196	16
Lincolnshire	463,259	18	573,366	0
Shropshire	303,569	10	340,568	0
Derbyshire	329,362	0	215,132	0
Nottinghamshire	228	0	11,750	0
Warwickshire	92,214	0	97,426	0
Staffordshire, N.	1,032,362	0	939,023	12
Staffordshire, S.	141,304	18	715,451	0
Lancashire	914,257	7	854,464	4
Cheshire	1,000	0	1,500	0
Cumberland	1,119,666	2	1,147,968	6
Westmoreland	504	0	...	...
Yorkshire, N. R.	5,614,221	11	6,121,794	9
Yorkshire, W. R.	370,960	7	353,528	0
Northumberland	122,450	17	60,515	15
Durham	42,227	9	43,184	0
South Wales	661,616	19	495,840	5
Monmouthshire	1,143	18	...	...
Iale of Man	2,119,717	0	1,452,335	0
Scotland	140,360	4	123,603	0
Ireland	...	...	...	...

Total iron ore pro-  
duction of the  
United Kingdom 14,844,936 10 15,811,000 3  
Of which was imported 255,000 0 280,000 0  
Iron ore imported 754,141 0 458,693 0

Total of iron ore  
smelted in the  
United Kingdom 15,854,077 10 16,559,753 3

**The Edgar Thomson Steel Company—**  
(Limited), ran in 1876, single turn from January  
1st to March 13th, and a double turn from March  
13th to November 3d, from which latter date to  
December 31 operations were suspended to  
make necessary repairs. The amount of ma-  
terials melted during the ten months was as  
follows:

	Gross tons.	Lbs.
Pig Iron	40,990	585
Spiegelheisen	4,214	1,898
Scrap	5,972	421
Total	51,047	664
Of which was scrap remelted	5,463	1,941
Leaving of material actually used	45,583	963

The monthly product has been as follows:

	Ingots.	Blooms.	Rolls.
January	2,350	2,472	3,005
February	2,407	2,199	1,810
March	4,346	3,497	2,800
April	4,026	3,565	2,623
May	5,403	4,663	4,128
June	4,340	3,928	3,346
July	4,510	4,493	3,548
August	4,796	4,758	3,773
September	4,239	4,348	3,641
October	4,980	4,739	3,923
November	665	839	450
December	...	...	...
Total	42,112	39,301	32,226

Amount rails produced 32,226  
Amount Blooms produced 420  
Amount Blooms sold 498

Total merchantable product 33,144  
This was produced in two and a half months,  
running single turn, and seven and a half  
months double turn, equal to less than nine  
months double turn, an amount of product  
never before equaled by any Bessemer plant  
in its first year's operations. The works started  
January 3d with the plant in much better con-  
dition, both for rapidity and economy of pro-  
duction, than ever before.



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AWARDED CENTENNIAL MEDAL AFTER ACTUAL TEST.

REPORT ON AWARDS. GROUP No. 15. PHILADELPHIA, November 11th, 1876.

Product: Saws in great variety: special improvement in shape of teeth, called Patent Lightning Saw. Name and Address of Exhibitor: Eben Moody Boynton, New York.

The undersigned having examined the product herein described, respectfully recommends the same to the United States Centennial Commission for award, for the following reasons, viz: Report: "Being of very Superior Quality and of great Practical Utility." DANIEL STEINMETZ, Signature of the Judge.

J. D. IMBODEN, of Virginia. CHARLES STAPLES, of Maine. G. L. REED, of Penn.

J. DIFFENBACH, of Germany. DAVID McHARDY, of Scotland. D. STEINMETZ, of Phila. Judges.

A true copy of the record. FRANCIS A. WALKER, Chief of the Bureau of Awards.

Given by authority of the U. S. Centennial Commission.

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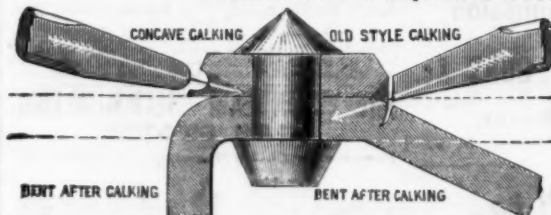
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Patented May 1874.

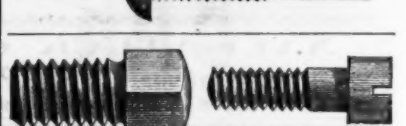
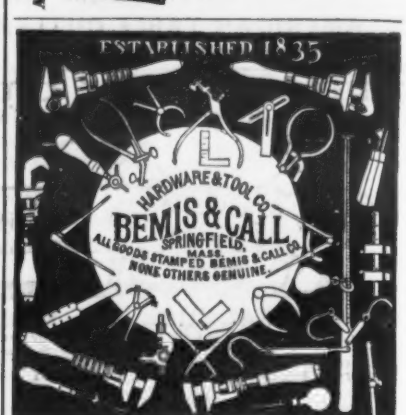
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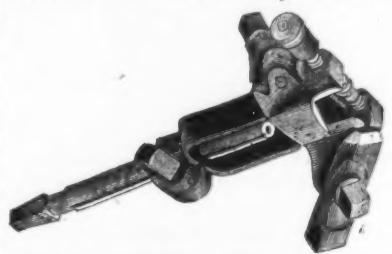
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New York, Thursday, January 11, 1877.

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**Thirty-ninth Page.**—Chicago, Boston, and St. Louis Hardware and Metal Prices.

A portion of our edition of December 28th having been destroyed in the railroad disaster at Ashtabula, Ohio, those of our subscribers in the West who have not received that number will be furnished copies upon application, until our supply is exhausted.

### The Bridge at Ashtabula.

In our issue of the 4th instant we referred briefly to the shocking calamity at Ashtabula, Ohio, and promised further comments when in receipt of fuller information. This information we have taken pains to obtain, and can now speak of the bridge and its construction from

personal knowledge. In the first place, let us say that a great deal has been published concerning the pattern, construction and general quality of the bridge, which has no foundation in fact. It was a deck bridge, with guard rails of the most approved pattern, which were brought to a point on the bank at either end. These rails were so disposed that, had a car jumped the track before striking the bridge, it would either have been forced back upon the rails or its wheels would have been made to run very nearly in line with those on the rails. The statement, which has found currency, that the fracture of the bridge was caused by the bumping of cars off the track, cannot be sustained by any evidence yet found. We do not believe that, at the time the bridge fell, any of the passenger cars were upon it. Indeed, there is positive proof to the contrary. When the bridge went down, the forward engine, according to the testimony of the engineer, was within two car lengths, or about 100 feet, of the west end of the bridge. Now, the total length of the span was only 150 feet, and as there were two engines and four express cars at the head of the train, it is impossible for more than the two engines and two of the four express cars to have been on the bridge at the moment it sank. The passenger cars must, therefore, have been upon the bank when the engine went down; consequently, the surviving passengers must be mistaken in supposing that the cars were off the bridge. The testimony of the engineer of the forward engine shows that his own engine was on the track.

Now, in what condition was the deck of the bridge to withstand the shocks produced by a car or engine running on the ties? First, we have the guard rails already mentioned, which we judge were about 3½ inches from the rails. The ties were 5 inches wide, and were only 2 inches apart from center to center, thus forming an almost continuous floor from end to end of the bridge, and we very much doubt whether a passenger in a car would know whether a train was on the ties or the rails under such circumstances. At a distance of a little more than 3 feet from the rails a heavy stringer was bolted to the ties to hold their ends in place. This also served as a guard beam, its outside edge being 4 feet 4 inches from the rail. Beneath the right-hand rail were two stringers, each 6 by 14 inches; and under the left-hand rail there were three such stringers. No one would have the least fear in running a car or cars over the floor of such a bridge, so far as the bridge itself is concerned, and cars have been safely dragged across bridges while off the rails where the distance between the ties was 8 inches instead of 2. In respect to flooring and track, the bridge was thoroughly first-class. Indeed, it was exceptionally good. It is doubtful if the most expert of our engineers who have given attention to bridge building could have suggested any change for the better in this respect.

The panels of the bridge were 11 feet in length, and the height from the center line of the bottom to the center line of the top chord was 22 feet. The span, as we have said, was 150 feet. The stone abutments were all right and still are. Some of the dailies have made a great talk about a supposed sinking of the masonry of one of the arches and abutments, and have thus framed a theory of the accident. This is simply nonsense. The crown of the arch at the west end of the bridge has settled slightly, so as to be apparent when sighting along the course, but it is evident upon examination that this took place during the construction, and was very probably due to springing or settling of the centering, allowing the keystone to come down an inch or so. A slight crack or opening of the joints has occurred, extending down toward the outer abutment of the arch, but this is not at all serious. To attribute the failure of the bridge to these imperfections in the masonry is folly. So far as they are concerned there is no reason why the bridge should not have lasted a thousand years.

From a careful examination of the wreck, we find the quality of the iron visible to be good—the suspension rods, where they can be seen, are very good. The castings are of exceptionally good iron, and we should say from the appearance of one or two which it was attempted to break in clearing away the wreck, that they were of a good quality of car wheel iron, since in one case the corner of the casting actually bent under the blows of the sledges. If we remember rightly only one casting was broken. At present the iron is so covered up by the ice and debris of the wreck that it is idle to think of forming an opinion concerning the cause of the disaster. Doubtless when the iron is taken out and the whole bridge examined an explanation can be found. This work will be done under the direction of a legislative committee, with the hearty co-

operation of the railroad officers. From the investigation of the coroner's jury, which is now taking testimony, we do not expect much. From present appearances they cannot do otherwise than acquit the responsible officers of the Lake Shore Road from blame, with a few general recommendations consisting principally of well-meaning platitudes.

The ill-fated bridge was designed and built some years ago by the company's engineers, and was the first constructed by the road. While not as perfect in its details as some of the bridges since built, it is not one which could be condemned off-hand, nor one with which the intelligent and impartial engineer would have been likely to find fault. We speak advisedly when we say that a careful and thorough examination of the plans of the bridge and of the wreck, reveals no cause of failure which can be accounted sufficient to explain it. Of course, such cause exists, but it is not of one of the kind which appears on the surface. An impartial judgment could not but have pronounced it a good bridge, and this fact renders it the more important that the investigation proposed by the Legislature should be searching. The conclusions of the committee may not be worth much, but from the testimony of experts, whose attendance as witnesses the committee will undoubtedly invite, we shall gain a vast amount of knowledge from which the engineer can profitably draw his own conclusions.

We spoke of the disaster in our first brief comments upon it, as a "disquieting accident." This is the more true in view of the facts since learned, and which we have stated above. If a bridge well built of good materials, and nearly, if not exactly, correct in its proportions, suddenly and without warning sinks in shapeless ruin under a load which could not have been within many hundreds of tons of the weights which have rolled over it safely during the period of its service, it offers a problem to the engineer which contains some new and important factors. Why may we not expect such a disaster at any moment and on any road? We know there are plenty of cheap, badly built bridges, which the engineers are watching with anxious fears, and which, to all appearance, only stand by the grace of God. When these fail we are not surprised; but when a bridge like that at Ashtabula falls under the weight of two engines and, at most, two cars, after several years service under a heavy freight and passenger traffic, we realize how much we have still to learn of the art of bridge building.

### Iron in Car Construction.

The question of employing iron as a material for passenger car construction is just now attracting a great deal of unintelligent newspaper discussion. In a general way, it may be said that those who know most about this subject have the least to say concerning it. When we begin to employ iron as a material for passenger cars we must be prepared to make our cars entirely of iron except, of course, the inside finish. It is no impossible thing to design such a car, yet any of our best builders would say that the task is at present by no means an easy one, because it requires such a wide departure from our present practice in order to meet the requirements of the new material. Doubtless iron is the material of the future, but at present the designs for iron passenger cars which have been made public are hardly worth consideration.

The plans and drawings submitted by Mr. O. Chanute at the last monthly meeting of the Master Car Builders Association, contained the first practical hints upon the methods of substituting iron for wood in railway freight cars, which have been given to the profession. Indeed, we think these designs the most important contributions to the science of car building in this country which have been made in a very long time. The designer has done what has not been attempted before—to adapt European principles of construction to the American railway freight car. In our freight work we have adopted almost exactly the same principles of construction as in the passenger car. Our designs have been made with special reference to the use of wood as a material. Mr. Chanute having in mind the rather poor record of iron cars in this country, set about designing a car without reference to what had been done before, and in which the iron should be used constructively. The floor, instead of being composed of many longitudinal sills, has its strength concentrated into two heavy beams, so disposed as to come directly beneath the load. The strains of drawing and buffing are taken by a pair of longitudinal members in the center. Buffing strains are also distributed to some extent by diagonals extending to the main sills. The cross constructions are of plate iron

worked in between the principal members. The outer sill of wood is carried from the main sill by brackets.

No dependence whatever for load carrying is placed upon the side or wall of the car. The house, or superstructure, is barely heavy enough to prevent its destruction by its own momentum in stopping and starting. In the construction of the floor of the car nothing but plain, straightforward work is found, just such as any iron shipbuilding establishment can do. The sections of iron used are those well known in the market—channel, T and angle irons, with a few flanged and gusset pieces, comprising almost the whole list.

It only remains to be said that cars of this description are of about the average weight, and are capable of carrying some 15 tons as a standard load. The cost will exceed a little that of the ordinary wood car—say, from \$150 to \$200. There can be little doubt that these plans fulfill the requirements of an iron car adapted to the wants of American railroads, cheap in price, strong, and having an average life of not less than 25 years.

At the same meeting Mr. Wilson, of the firm of Wilson, Walker & Co., of Pittsburgh, exhibited some very interesting specimens of iron with steel centers, or steel bars plated with iron which are especially suited for car building work. They might be described as composite bars, the relative amounts of steel and iron being varied to suit circumstances. The weld was perfect, and the steel and iron draws down together with perfect regularity. Some of these bars have been tested, and a tensile strain of 115,000 pounds per square inch obtained from a specimen ½ inch by 2. The firm are making experiments with axles made in this way, the steel being cored through each axle. Great strength and toughness are thus combined. Any of the ordinary shapes are manufactured. Special attention is being paid to angle, channel and bar irons adapted to car builders' uses. These irons weld as perfectly as ordinary bar and with no more difficulty. The method of manufacture is peculiar and interesting. A box of wrought iron is turned up from a plate and fitted with a cover. This is filled with steel scrap, and the cover fitted on. It is then heated and treated in the same manner that a bloom would be, under a hammer or in the rolls. The combination seems to be one which will be of the greatest value in the arts, and we shall watch its development with interest.

### The Increased Production of Quicksilver.

According to estimates telegraphed from the Pacific Coast the states and territories west of the Missouri River produced in 1876 \$44,328,000 in gold, and \$41,538,700 in silver, Nevada standing at the head of the list with a production of \$49,081,000 of the precious metals, followed by California with \$18,615,800, the remaining \$18,167,900 being made up by Utah, Oregon, Arizona, Montana, Idaho and Colorado.

This copious production of the precious metals having involved a very large consumption of quicksilver, the steadiness in the value of the latter in spite of an enormous yield is satisfactorily explained. During the latter half of the past year the price at San Francisco at one time advanced to 57½¢, gold, per pound, but the large receipts caused it to recede to 50¢. London has also varied little from £8. 10/ per flask, the present figure, the demand having been all along fully up to the supply, notwithstanding a larger output in Spain.

The success which has attended operations at great depths in the Virginia City mines, has been followed by similar attempts in other silver producing countries, and the comparative cheapness of quicksilver has, moreover, allowed the working of inferior ores brought to the surface in many localities. At the same time the advance in silver from 46d. to 55d. (something like 20 per cent.) since midsummer, has imparted renewed stimulus to silver mining generally, and quicksilver has been in all the more active request.

The quicksilver export from San Francisco from January 1 to July 1 was as follows:

To	1875.	1876.
New York.....	12	1,423
Mexico.....	3,605	202,050
Chile.....	355	2,924
New Zealand.....	25	1,398
China.....	4,863	301,639
Japan.....	306	21,945
Central America.....	4	210
British Columbia.....	10	586
England.....	100	7,650
South America.....	1,080	96,516
Australia.....	332	21,069
Calcutta.....	10	820
Russian Asia.....	3	193
Total.....	9,665	\$680,764

Up to December 7, 1876, there were exported 38,964 flasks, worth \$1,557,490, against 27,323, amounting to \$1,617,289 in 1875, an excess of 11,641 flasks, and a decrease in value of \$59,790.

The monthly receipts during the first eleven months footed up as follows:

	1875.	1876.
Jan. 1 to Nov. 30.	Bay, flasks.	Coast, flasks.
January.....	1,665	2,877
February.....	3,284	3,864
March.....	3,779	3,262
April.....	3,718	1,813
May.....	3,298	4,954
June.....	3,716	5,308
July.....	4,329	4,510
August.....	4,016	6,627
September.....	4,746	4,877
October.....	4,899	5,977
November.....	5,278	6,514
Total.....	42,628	54,643

They were consequently about 27 per cent. in excess of the preceding year.

Estimating last year's total increase of production to have been in the same proportion, we have an output of 68,200 flasks, against 53,700 in 1875. The Spanish output may be valued at its maximum in 1870, say, at 41,000 flasks instead of 36,000 flasks in 1875, and that of Mexico at 500 instead of 900. With these changes we should have the following result for the year just ended:

California.....	68,200
Spain.....	41,000
Idria.....	8,000
Palatinato.....	2,400
Italy.....	2,700
Borneo.....	2,000
Mexico.....	500
Total.....	124,800

against 105,700 in 1875, an increased yield to the amount of 19,100 flasks, or 18 per cent.

### The Population of the World.

The latest estimates of the world's population, as given in the fourth annual edition of Behm and Wagner's statistical work, give the whole population of the globe for the present year as 1,423,917,000. The area of the land surface they calculate to be 51,340,800 square miles, thus giving an average density of about 28 people to the square mile. These data are apportioned among the various divisions of the globe as nearly as possible as follows:

	Square Mile.	Inhabitants.	Density per square Mile.
Europe.....	3,776,493	309,178,390	82
Asia.....	17,079,383	894,548,500	52
Africa.....	11,415,804	199,921,600	17½
Australasia & Polynesia.....	3,381,310	4,748,600	1½
America.....	15,687,840	85,519,800	5½

These figures can only be regarded as, at best, a rough approximation, though based upon the best data at hand. The population of Asia and Africa can only be guessed at, and the same is true of Australasia and Polynesia. The populations of the various states of Europe are estimated as follows:

Germany, 1875.....	42,723,942
Austria-Hungary, 1876.....	37,700,000
Spain, 1870.....	16,561,647
Switzerland, 1870.....	12,000
Portugal, 1874.....	4,328,881
Netherlands, 1875.....	27,482,174
Belgium, 1874.....	5,336,634
Denmark, 1875.....	2,805,337
France, 1875.....	36,102,921
Great Britain, 1876.....	38,450,000
Russia, 1870.....	71,730,980
Sweden, 1875.....	4,383,391
Norway, 1875.....	1,502,882
Denmark, 1875.....	1,903,000
France, 1875.....	36,102,921
Greece, 1870.....	1,457,894
Romania, 1875.....	3,800,000
Serbia, 1875.....	1,377,063
Montenegro.....	190,000
San Marino.....	5,741
European Turkey.....	7,816

The following details are interesting: The population of British India is nearly less than last year, being 188,098,700, that of British Burmah being about 2,750,000, including tributary or protected states. The whole population of British India is close on 239,000,000. The population of China is 405,000,000, with 28½ millions of outlying people. Japan is set down at 33,209,014. According to latest statistics, the whole population of Australia amounts to 1,867,000; of New Zealand to 421,326. In the Fiji Islands the native population seems to be rapidly decreasing. It is calculated now not to exceed 70,000, while the whites, who in 1872 numbered 2940, were last year only 1650. There is an increase over the whole of America of upward of 1,200,000 over the number given last year. This increase seems to a considerable extent due to the fact that more recent statistics have been obtained since last year's data in many instances, referring to 1875 and 1876. Canada is still 3,675,116, and the United States nearly 40 millions. Mexico stands at 9,376,079, and this must be from quite recent data, as last year's number was that of 1872. The Central American States show a slight decrease, the number this year being 2,328,164; the West Indies, 4,316,178, and all South America, 26,300,700, of which Brazil claims upward of 11 millions. There are 29 towns whose population reaches or surpasses 500,000. Those at or above a million are: Berlin, 1,045,000; Canton, 1,000,000; London (1876), 3,489,428; New York, with Brooklyn (1875), 1,835,622; Paris, 1,851,792; Shanghai, Hankow, and Szeifu (China), each 1,000,000; and Vienna, 1,001,999.

The population of New York should include beside Brooklyn, Jersey City, Hoboken and all that lies between, the fact that they are in another state does not make them any the less a part of one great city which is rapidly spreading in all directions. Had New York been built on the main land, with its harbor in front and a broad stretch of unbroken country behind, a hundred cities and towns which have been built up from its overflow, and which serve as dormitories for New York business men, would have all been wards of one great metropolis. As it is, the geographical limitations of Manhattan Island are an insurmountable obstacle to the concentration within our corporate limits of what is really our population.

The annual meeting of the National Association of Stove Manufacturers will be held in the Common Council Room of the New City Hall, Troy, N. Y., on Wednesday, Jan. 17th, at 11 o'clock, a. m. From small and doubtful beginnings this Association has grown strong in numbers and influence. It is a national association in the truest sense, and has already resulted



in great benefit to the stove founding industry. As the condition of the stove trade is just now very peculiar, the problems to be considered at the meeting will be of exceptional interest to manufacturers, and it is hoped there will be a large attendance from the West. The Association is in a position to render important service to the trade in remedying some of its most hurtful abuses, and under the wise and conservative leadership of Mr. Jewett, its deliberations cannot fail to be harmonious and profitable.

During the present week one of the richest men of the nation was carried to burial—a man who had lived out more than the allotted three score years and ten, and who, from boyhood to the day of his death, has been a vigorous, energetic and successful man. He was called the "Commodore" and the "Railroad King," and occupied a position of controlling influence for a generation; but his death leaves no void, and only his personal friends and relatives will miss him. The great enterprises he founded and successfully managed will go on as before, and others will consummate what he began as well as if he were still here. The man was great in many ways, but while his business policy was dictated by considerations of self-interest only, he rendered important services to the public as a common carrier. It must be conceded, however, that he failed to employ the vast powers of his wealth and influence in that large and liberal way which would have made him entirely great, and worthy of a place in our national history. As it is, his fame consists in the enormous measure of his wealth, and even this will be forgotten a generation hence. We do not blame Mr. Vanderbilt for the selfishness of his life. He was born in poverty, won his way to wealth by a rigorous industry and close economy, and when he had wealth he employed its possession in the only way of which he was capable. He was not a miser, but he held his wealth with a firm grasp, and parted with it only for value. He was a representative man of a very large class of successful money getters, and all we can expect of them is that they shall incidentally benefit mankind in promoting their own interests. They have no conception of the pleasure which open-handed benevolence gives to those who love their fellow men, and we cannot look to them for large aid in carrying on or sustaining the great charities or advancing the progress of the arts and sciences.

And so we are to have another coal combination, provided the Lehigh Company will come in and give bonds to keep peace in the family. The committee appointed at the meeting of the coal operators on Friday have interviewed the various railroad officials who are to constitute the new ring, and report that the negotiations are progressing very satisfactorily. The Delaware, Lackawanna and Western Company had not fully agreed to join at last accounts, but it is said that the points of difference can be satisfactorily adjusted. We confess we are sorry to hear it. Coal mining and carrying is a business which is not essentially different from any other business in which competition exists, and if it cannot be made to pay except through a combination of producers, which seeks to set at defiance the laws of trade and to maintain prices on an artificial basis by artificial means, it must be accepted as a confession that the gentlemen who manage the coal business of the country are not competent to do so. If this be true—and we fear it is—a combination will not save them. The trouble is that the coal traffic of our great mining and carrying companies has to pay too much interest. It cannot continue to do so under present conditions, and it is doubtful if it will be able to in the future. "Vaulting ambition which o'erleaps itself," has characterized the management of these great companies, and they will need the best and most prudent management during the next ten or twelve years to put them on their feet again. A combination to restrict production and maintain prices above the level at which a healthy and natural competition would place them, can only end in just such a crash as we have had in the coal market during the past half year.

The annual report of the Reading Railroad Company makes "a poor exhibit this year. It shows the total receipts during the year to have been \$13,919,993.55, and expenses, \$6,129,757.72, a decrease of \$443,416 in receipts, and increase of \$380,094 in expenses as compared with the previous year. The net profits were \$3,717,161, showing a decrease of \$850,607 as compared with the previous year. The net profits have been insufficient to meet the fixed charges against the company, the deficiency being \$1,355,708.58. The tonnage of the company was 10,

236,326. The loss in the year's business of the Reading Coal and Iron Co. is \$203,642.59, after charging off for depreciation of the stock of coal on hand at the dissolution of the coal association the very large sum of \$931,705.45. This loss is increased \$653,539.03 by bad debts charged off and depreciation of property and stock of iron. The entire indebtedness is \$17,728,041.68, and the entire annual fixed charges of the railroad company \$5,279,367. Of the whole number of shares of stock, 376,991 are held by American stockholders and 308,672 are held abroad. A resolution approving of the issue of \$10,000,000 of income mortgage bonds was adopted, and Mr. Gowen was re-elected president. We are not very familiar with what is known as "railroad financing," but we should think that, considering the nature and market value of some of the principal assets of the company, a deficit of \$1,355,708 in the net earnings was a rather slender basis for the issue of \$10,000,000 of income mortgage bonds.

The English capitalists who undertook to confer upon China the benefits of railway facilities manifested a courage which is worthy of all commendation. The conditions of the charter are very stringent, and the difficulties experienced by the management are of a kind which may be considered discouraging. When the first line was opened last summer, a crazy man, who threw himself in front of the engine, was run over and killed. It was a clear case of deliberate suicide, and the corporation were evidently in no way responsible for the man's death. The engineer had stopped the train and the man stepped aside unhurt, but as soon as the train was started again he leaped back upon the track and was killed, as he evidently desired to be. The engineer was hailed before the courts, however, on the charge of murder, and promptly acquitted. But the matter did not rest here. The corporation was enjoined from running any more trains, and, according to the text of the Woosung Railway Convention, signed late in November by the Chinese officials and the Secretary of the British Legation, at Peking, the shareholders will have to pay heavy damages to the family of the lunatic. They might expect in time to outlive this foolish prejudice, which places so many and serious obstacles in the way of the enterprise, but it is doubtful if they are allowed to do so. The company have the privilege of operating the road for a single year, after which it will become the property of the Chinese government. If it does not pay expenses, the rails will probably be torn up, and railroad progress in the Celestial empire will be checked. One of the articles of the agreement limits the traffic to the transportation of passengers. Evidently there are more inviting investments than are offered by the securities of Chinese railways.

The two serious marine disasters which have occurred during the past week show in a marked degree the uncertainties of the sea. The French steamer *l'Amerique*, which has an unlucky record, went ashore near Long Branch while in the hands of a pilot whom, we may suppose, was a competent and intelligent navigator. Fortunately, as in the two previous accidents to this ship, no lives were lost. The other disaster was the sinking of the steamer *Montgomery*, en route from New York to Havana, from the effects of a collision with the steamer *Seminole*, on her way from Savannah to Boston. In this case there was a considerable loss of life, including four passengers and nine of the ship's company. This is not to be wondered at, considering the fact that the *Montgomery* sank in six minutes, showing that she was probably cut nearly in two by the *Seminole*, which struck her amidships, the course of the two vessels being nearly at right angles. Unfortunately, they teach us nothing which will enable us to guard against like disasters in future.

#### Production of Pig Iron in the United States in 1876.

The forthcoming issue of the *Bulletin of the American Iron and Steel Association* will contain the following:

Below we present a table embracing a carefully prepared estimate of the production of pig iron in the United States in 1876, and of the stocks of pig iron carried forward into the year 1877. Since the publication by us of a similar table in January of last year we have greatly perfected our means of acquiring information from the furnaces, and we submit the accompanying estimate with great confidence in its substantial accuracy. The figures contained in the table which follows were obtained in part directly from the producers, and in part from a corps of one hundred special correspondents of this office, residing in every district in the country which makes pig iron—correspondents selected by us because of their experience and judgment as iron manufacturers and business men, and because of the superior

facilities possessed by them for procuring the information we desired.

Our method of procedure in acquiring information not obtainable on short notice directly from the producers has been briefly this: A confidential letter was addressed to each of our correspondents about the middle of December, giving them the exact figures of production and stocks in their respective districts in 1875, and requesting that careful corresponding estimates for 1876 be sent to us not later than December 31st. We could send our correspondents the exact figures for 1875, because they were a matter of record in this office. With the figures for his district for 1875 before him, a first-class business man engaged in the production and sale of pig iron could not have much difficulty in making an approximately correct estimate of the work of the district in 1876 in producing and selling iron; if more than in 1875, how much more; if less, how much less. If we could hear from every correspondent, we would have a close approximation to the exact figures of production and unsold stocks in 1876—close enough for all practical purposes, and abundantly sufficient to satisfy the wants of the trade. Exact returns from every furnace in the country, we have learned in four years of experience, cannot be obtained in less than three or four months after the close of the year for which statistics are desired. Rather than keep American ironmasters waiting so long, we have adopted the plan of presenting a close estimate early in January, the machinery for obtaining which is above explained.

We are pleased to say that we have heard directly from every district which made pig iron in 1876, and from more than one correspondent in almost every district. We have also heard directly from many producers. The aggregate returns are as follows:

States and Districts.	Production. Net tons.		Stock on hand Dec. 31. Net tons.	
	1875. Exact figures.	1876. Estimated.	1875. Exact figures.	1876. Estimated.
New England.....	26,581	18,000	35,604	25,000
New York.....	266,431	181,000	83,903	67,000
New Jersey.....	64,069	31,000	26,095	5,000
Pennsylvania.....	960,884	989,000	246,908	275,000
Maryland.....	38,741	20,000	13,767	4,000
Virginia.....	29,985	6,000	9,749	4,000
North Carolina.....	800			
Georgia.....	16,508	15,000	3,400	3,000
Alabama and Texas.....	25,108	25,000	20,921	20,000
West Virginia.....	25,377	45,000	3,400	5,000
Kentucky.....	48,339	35,000	27,590	15,000
Tennessee.....	28,311	27,000	19,559	10,000
Ohio.....	415,893	383,000	128,033	124,000
Michigan.....	114,863	84,000	52,167	31,000
Indiana.....	32,081	19,000	5,381	3,000
Illinois.....	49,762	53,000	5,316	10,000
Wisconsin.....	62,139	51,000	10,392	5,000
Missouri.....	59,717	69,000	61,769	55,000
Pacific States and Territories.....	1,150	1,000	454	.....
Total.....	2,266,581	2,050,000	760,908	660,000

Pennsylvania and Ohio by Districts.			
Pennsylvania.			
Lehigh Valley.....	280,360	260,000	50,878
Schuylkill Valley.....	123,184	129,000	79,155
Up'er Susquehanna.....	71,731	77,000	13,960
Lo'er Susquehanna.....	79,717	101,000	19,163
Shenango Valley.....	127,085	120,000	25,000
Allegheny County.....	131,856	135,000	4,920
Miscellaneous bits.....	102,520	130,000	21,323
Charcoal.....	34,491	17,000	23,392
Total for Penna.....	990,884	989,000	246,908
Ohio.			
Hanging Rock bituminous.....	36,899	35,000	17,523
Hanging Rock charcoal.....	67,418	40,000	53,382
Mahoning Valley bituminous.....	115,993	134,000	14,611
Miscellaneous bituminous and charcoal.....	205,568	174,000	42,017
Total for Ohio.....	415,893	383,000	128,033

#### American Steel at the Centennial.

(Continued.)

We give below further descriptions of the American steel exhibits, which, with what we have given in previous issues, comprises all the displays of steel and steel castings except Bessemer, which will be reserved for future consideration. Owing to the crowded state of our columns for many weeks past, we have been compelled to defer these notices longer than we had intended:

##### HUSKEY, WELLS & CO.

In our former notice of the display of this firm we omitted to mention what was by far the most interesting portion of their exhibit, viz., the glass case in the Smithsonian Department in the Government Building. Though ore, muck bar and finished steel were shown, the special point of interest was the two series of four crucibles, each showing the gradual conversion of iron into steel when heated in connection with chemicals. To show this, the crucibles were subjected to heat for different periods of time, and then cooled, and one side of the crucible removed to reveal the effect of the heat. One series of crucibles showed tool steel and the other common. Of the four crucibles in each series, No. 1 had been heated 1½ hours; No. 2, 2 hours; No. 3, 2½ hours, and No. 4, 3 hours. The tool steel series was charged with a mixture of cut wrought iron, charcoal and chemicals, and the common steel crucibles with common charcoal iron and scrap with charcoal and chemicals. Even a cursory examination of the crucibles showed the greater refractoriness of the tool steel mixture. In No. 1 the materials were not melted in the least, even the chemicals being still intact. No. 2 had a very small button of melted metal in the bottom. In No. 3 the material was about half melted, and in No. 4 fully melted. In the common steel series No. 1 crucible, exposed to heat the same length of time as No. 1 in the tool steel series, had about as large a button of metal as No. 2 of the tool steel. No. 2 of the common was fully melted. No. 3 was more compact, and No. 4 was ready to pour. In No. 3 of this series the surface showed a protuberance due to ebullition. While this exhibit was by no means as attractive to the throng as some others, or as the beautiful exhibit of this firm in the Main Building, it possessed exceptional interest for the metallurgist.

##### H. DISSTON & SONS,

Philadelphia, in connection with their very extensive display of saws, files and other tools near the Corlies engine, showed samples of their steel in the bloom, ingot and sheet, as well as shaped blanks for saws, trowels, etc. To the right of the main display, facing it, was a pile of ingots from 143 to 295 lbs. in weight, a similar pile of hammered blooms from 130 to 275 lbs., and a smaller pile, oval shaped, weighing from 8 to 22 lbs. These blooms were for use in saws. There were also some specimens of homogeneous boiler plate, flanged. On the rear of their large display board were shown some specimens of sheet steel and saw plates, and also some trowel blades. Judging of the quality of the steel by the reputation which the goods manufactured from it have obtained, we have no hesitation in speaking of it in terms of the highest praise. The advantage to this firm of making their own steel must be evident. It gives them an absolute control of the product, and secures that uniformity which is so essential, and which is so much more easily attained when running so constantly on one grade, as in the nature of their circumstances they must do than when constantly changing. This house began the manufacture of steel in 1854, and have now 42 melting furnaces, 2 trains of rolls, 6 heating furnaces and 1 hammer, giving an annual capacity of 2500 tons.

##### MESSRS. REESE, GRAFF & WOODS,

Pittsburgh, exhibited in the collective display of C. W. & H. W. Middleton samples of the various grades of crucible steel made by them, such as machinery, spring, shear, sheet, plate, tool and special steels for agricultural purposes. This firm is one of the very few in the country that manufacture both iron and crucible steel.

##### THE RAY STATE IRON CO.

Though this company object to the classification of their homogeneous boiler plate made on the open hearth principle as steel, we place it under this head for the reason that we have placed here all others of the same class. Their exhibit in Machinery Hall was mainly, if not entirely, of homogeneous metal, flanged, twisted, bent, and some test pieces, both of plates and bars, which showed a thoroughly homogeneous metal, and, judging by the fracture, well adapted to its use as boiler plate. Some of the larger bars that have been polished and twisted cold showed a remarkable freedom from chipping on the edges.

##### COLLINS AXE CO.

This company made no display of crude steel, but the tools exhibited in the Main Building may be taken in part at least as samples of the steel made at their works at Collinsville, and the plows in Agricultural Hall of their cast steel or steel castings, of which they were among the earliest manufacturers in this country.

##### MR. J. C. BIDWELL,

of Pittsburgh, in connection with his display of plows, etc., in Agricultural Hall, had a display of steel castings that was worthy of a far better position, and a location among our best American iron and steel exhibits. Notwithstanding troubles in the past, and in spite of the fact that all parties manufacturing steel castings are not successful, there can be no doubt that the use of steel in castings is rapidly extending. We speak now of cast steel and not of iron castings converted or case hardened. It is claimed for these castings, and so far as our knowledge goes, with justice too, that they are an invaluable substitute for iron castings, or expensive wrought iron forgings, where great strength and durability are required. Mr. Bidwell is making all kinds of cast steel castings to pattern under a patented and improved process, of superior quality, close in grain and capable of receiving the finest finish. The steel is made principally of Norway iron, and melted in crucibles. It can be hammered, drawn out, and given any required temper, and is especially adapted for all descriptions of machine and railroad castings. To show some of the uses to which it is put we may mention that among the exhibits were samples of links, connecting rods, cog wheels, pinions, plow-shares, fifth wheels, wagon skids and axle boxes in great variety, finished and unfinished, all sizes, wrenches, 11 different sizes, etc. Among the most interesting samples were two large nuts similar to those made for the Bonanza Mines. The nuts weigh 100 lbs. each, and are used on mine pumps.

##### STANLEY G. FLAGG & CO.,

216 and 218 North Third street, Philadelphia, made a display near the Corlies engine, in Machinery Hall, of what they term steel castings, though we judge that the castings are not crucible steel but are converted. The display consisted of a large number of articles, such as nuts, bolts, wrenches, hammers, file blanks, vise jaws, shuttles, pruning shears, gas pipe tongs, carriage hardware, gearing, cranks, cross heads, connecting rod yokes, etc. Two brands are made, known as "Keystone" (cupola) and "Union" (air furnace). In regard to these and their process, which is patented, they say: "By this process we are enabled to make these castings of any desired pattern, weighing as small as one-half ounce, with the advantage of not being rough or porous, but as perfect and true as the smallest iron casting; possessing also solidity, durability, and great tensile strength, such as are required where steel and wrought forgings have heretofore been used. The castings designated as the Keystone brand are particularly adapted for small articles, such as sewing machine parts, firearm parts, &c., requiring a fine, soft casting, easily worked, and are possessed of a very essential requisite, viz., that of being easily hardened. The castings designated as the Union brand are particularly adapted for larger articles, such as parts of machinery, agricultural implements, &c., and are very strong, soft, and solid, and free from flaws and imperfections. All castings made by our process are susceptible of receiving a very fine

polish, and are an invaluable substitute for wrought and steel forgings, where great strength is required, and at a price materially less."

##### CARR, CRAWLEY & DEVLIN,

of Philadelphia, exhibited some steel castings which were made to order, being molded over patterns the same as other castings, and bearing the same relation to worked or forged steel that malleable iron castings do to wrought or forged iron. They are used as a substitute for forgings of steel or wrought iron when great strength of material is the principal thing desired. The strength of these castings, as determined by Prof. Thurston, was found equal to a tensile strength of 35 tons to the square inch.

#### The Industrial Uses of Asbestos.

A writer in the *American Exchange and Review* says:

The daily increasing importance of asbestos in connection with packings, bearings for journals, coverings for boilers, and similar purposes, has directed attention to other applications and uses of this material, and to the patents under which exclusive rights to its employment are claimed. Being a natural substance, long known as a possible substitute for animal and vegetable fibers, and its refractory and lubricating properties recognized for hundreds of years as its peculiar characteristics, it would seem improbable that any exclusive proprietorship, based on the utilizing of these properties, could be claimed or acknowledged at this late date; yet it is by no means uncommon to find advertisements implying the right in some party to the sole use of asbestos for this or that purpose, or to find that capitalists have been induced to invest their money in the experimental manufacture of asbestos products, to be protected under the patent laws.

Asbestos, or amianthus, is a mineral of a white or greenish-white color, found in dense heavy blocks capable of being divided into fibers of greater or less fineness and length, and resembling hair silk; it is smooth and unctuous to the touch, and, like plumbago, these qualities are available for lubricating or anti-friction purposes. The mineral is extensively distributed, but much of it is coarse, discolored, or in a disintegrated condition, which renders it unserviceable for any purposes to which asbestos has yet been applied. The finest beds are in Corsica and Italy, but a very fair article is found extensively in Canada, Pennsylvania, Maryland, Virginia, and other places. Efforts to utilize this mineral were early made in the historic period, and one of the first applications was in the manufacture of incombustible fabric. For this purpose vegetable filaments were combined with the mineral fiber, to give strength and consistency during manipulation, the vegetable fiber being burned away after the formation of the fabric. Notwithstanding this fact the combination of asbestos and animal or vegetable fiber has constituted the basis of many patents, some of which are in existence, while others have expired. An English patent, No. 145, for the year 1857, describes a lamp wick of silk and asbestos woven together. Prior patents describe wicks wholly of asbestos; and a later patent, No. 2647, for 1865, describes the plaiting of asbestos in a braiding machine, and also felting it or weaving it into ordinary fabric, to be used for lamp wicks. As a fabric, asbestos was once used in the manufacture of shrouds. One of the earliest applications was in the form of paper, and the efforts to render it available for this purpose have been most persevering and unremitting to the present time. An early description of the mode of making asbestos pulp for paper is contained in an English patent, No. 1413, for the year 1853, the process consisting of boiling the mineral, dividing the fibers, and mixing alum therewith. Advantage was early taken of the non-conducting qualities of asbestos in the construction of safes—a reference to its use for this purpose being made in an English patent of 1834, No. 6555—but it was not until 1870 that it was applied as a non-conductor in refrigerators, when F. Hyatt obtained a United States patent for a refrigerating car. Being flexible, non-combustible, and a natural lubricant, its employment as a packing for pistons or piston-rods, joints, and pump plungers, naturally resulted. Its adaptation for such purposes is fully set forth in the United States patent for steam engines, obtained by Israel Jennings in 1828. Notwithstanding this fact, several existing United States patents have claims for the use of asbestos for packings and joints, while others claim imparting to a rope form for packings, which is clearly described by Jennings. Other patents have been granted for the application of asbestos to journals or bearings, notwithstanding the existence of Jennings' patent, and also of an English patent, No. 2048, of 1853, for a lubricating combination of asbestos, quillsilver, fats and oils. A combination of asbestos, soapstone and cotton is described in P. S. Devland's patent of August 23d, 1865. C. A. Stevens' patent of March 29th, 1870, claims the insertion of a cord in a rope packing of asbestos to strengthen it; and Morris Botticher's patent of October 4th, 1864, refers to the use of the mineral for packing in a loose mass of fiber. A combination of asbestos with plumbago and iron filings is claimed in P. J. Kelly's patent of November 8th, 1870; and a combination of asbestos and clay in Lanbureau's English patent, No. 213, for the year 1859, where the mixture is shown molded into bricks or forms for lining fire-boxes. Combined with felt or pulp, and made into sheets, asbestos has been for some time applied for roofing, under H. W. Johns' patents of 1868; in 1866 it was applied to carbureters, as specified in J. A. Bassett's patent of September 18th; William Beschke's patent of August 14th, 1866, its use in lamps, to absorb the oil and prevent its distribution in case of fracture of the lamp; and the English patent, No. 862, for the year 1865, is based on the insulating property of asbestos, and its use as a non-conducting material in electrical apparatus.



TACKS, LINING, SADDLE NAILS  
 UPHOLSTERS, CARPET, BRUSH TACKS, CIGAR BOX, FINISHING, PATENT BRAIDS, SHOE NAILS, AND SADDLE TACKS, LINING NAILS, SADDLE NAILS, CURTAIN TACKS, TUFTING, BUTTONS, AND NAILS, OF ANY COLOR.

# TACKS, LINING, SADDLE NAILS

## AMERICAN TACK CO.

Factory at Fairhaven, Mass. N. Y. Salesroom, 117 Chambers Street.

ANY SIZE OR STYLE OF TACK MADE FROM SAMPLE TO ORDER.

**THE VICTOR PLANES**  
 Are the most simple, compact and practical Adjustable Planes ever offered to the public. They are made under the personal supervision of Mr. L. BAILEY, the original inventor of L. BAILEY'S PATENT ADJUSTABLE IRON PLANES. All our Planes have our Trade Mark. Send for Catalogue, embracing Planes, Try Squares, Bevellers, Rules, Levels, Hammers, Mitre Boxes, etc., etc.

### LEONARD BAILEY & CO.

MANUFACTURERS OF MECHANICAL TOOLS.

PATENT ADJUSTABLE IRON PLANES, TRY SQUARES, BEVELS, BENCH PLANES, &c.

100 CUSHMAN STREET, HARTFORD, CONN.

## HOTCHKISS' PATENT NOVELTY COMBS.

HOTCHKISS' SONS, Bridgeport, Conn.

THIS CUT ILLUSTRATES THE GRASPING OF THE COMB.

These Combs do not intrude upon the rights of any one. They are the simplest, Neatest and Most Durable COMBS ever offered to the trade, and are easily grasped for the hand, without the use of the ordinary side handle, and are universally acknowledged to be superior to all others. They are neatly put up in paper boxes of one dozen each, and packed 24 dozen in a case. Special net prices furnished on application.

Sample and Warehouses with GRAHAM & HAINES, 113 Chambers Street, N. Y.

CENTENNIAL EXHIBITION PRIZE MEDAL AWARDED.  
 WARRANTED.

## The Double Screw Parallel "Leg" Vise

Stronger than any other, whether of Foreign or of American make; always parallel and holding with a tighter "grip." The jaws are of convenient shape for the workman to get near his work equally well for filing or chipping instead of the heavy, clumsily formed jaws of the cast iron Single Screw Vises of the common "parallel" type.

Our Vise combines all the advantages of the "Peter Wright" Leg Vise, of strength and lightness, fastening to the floor and bench, and at the same time greatly superior to it: it is always perfectly parallel at all points of opening, and never gets out of line. We now warrant these Vises for three years from date of manufacture stamped upon each.

The Jaws are of best Tool Cast Steel, welded on, file cut and properly hardened. The screws are forged of the best refined iron, and work in solid cut thread boxes. The lower screw maintains the parallel position of the two jaws, by having exact motion with the upper working screw through the connecting chain which regulates it. The chain has no strain of the work upon it, and is therefore as durable as all the other parts.

**REDUCED PRICE LIST.**

No. 1. Jaws 2 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 9 in. long, opens 4 1/2 in.	\$7.00
No. 2. Jaws 3 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 13 in. long, opens 5 1/2 in.	\$11.00
No. 3. Jaws 4 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 16 in. long, opens 6 1/2 in.	\$16.00
No. 4. Jaws 5 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 19 in. long, opens 7 1/2 in.	\$20.00
No. 5. Jaws 6 1/2 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 21 in. long, opens 9 in.	\$27.00
No. 6. Jaws 8 in. x 1 1/2 in., Screws 1/2 in. diameter, Lever 26 in. long, opens 10 in.	\$30.00

All sizes of these Vises furnished with swivel Attachment at same price.

THESE GOODS ARE SOLD BY THE GENERAL AGENTS (with special discounts to the trade.)

New York.—Messrs. J. CLARK WILSON & CO.—  
 RUSSELL & ERWIN MFG. CO.—Messrs. HORACE DURRE & CO. Boston.—Messrs. GEORGE H. GRAY & DANFORTH. Philadelphia.—Messrs. JAMES C. HAND & CO. Baltimore.—Mr. W. H. COLE. Louisville.—Messrs. W. B. BELKNAP & CO.

FISHER & NORRIS, Sole Manufacturers, Trenton, N. J.

"THE DUNLAP" CAN OPENER.

PATENTED February 29, 1876.

Opens a Can perfectly, whether round or square. The Blade is of the best steel, the handle malleable iron, refined finish. Samples furnished the Trade. SARGENT & CO., New York City; Wm. B. RAY & Co., Chicago. J. S. DUNLAP, Manufacturer, Peoria, Ill.

## W. B. BELKNAP & CO.,

LOUISVILLE, KENTUCKY,

### Founders and Tinnners' Supplies.

Boiler Sheet Iron,  
 Harvey's Patent Cleaned Smooth  
 C. C. Pan Iron,  
 Planished (Am. Russia) Sheet Iron,  
 Galvanized Sheet,  
 Stove Rods,  
 Hammers,  
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 Babbitt Metal,  
 Pig and Bar Lead,  
 Tinnners' Solder,  
 Spelter,  
 Pig and Bar Tin,  
 Tinnners' Rivets,  
 Boiler Rivets,  
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Write for quotations.

## C. C. Harlow & Co.,

BRIDGEWATER, MASS.,  
 Manufacturers of

### D'A'MAN

#### Standard Hollow Augers,

Universally acknowledged superior to any other in the market. They have recently been improved, making them, as now offered to the trade, the most perfect tools of their kind, either in design, material or workmanship.

#### Spoke & Dowel Trimmers

The very best as well as cheapest.

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Made of solid cast steel and of gun metal. Of an entirely new design. Can be used as Groover, Dado and Bobbet Plane, in any direction of the grain, and also as a Match Plane.

#### Common Sense Door Spring.

The most durable and cheapest Door Spring yet made.

#### LEAD PIPE CUTTERS.

To cut lead pipe in any position and without chips or burrs.

Please send for circulars and prices.

## AUSABLE HORSE NAILS

POLISHED OR BLUED.  
 HAMMERED AND FINISHED

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Manufacturers of the following Patented Articles of

### MALLEABLE IRON:

Hammer's Adjustable Clamps.  
 Hammer's Malleable Iron Oilers.  
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For Sale by all the principal Hardware Dealers.

#### Malleable Iron Castings

Of superior Quality and Hardware Specialties to Malleable Iron made to order.

PECK'S PAT. DROP PRESS

I have the largest and best stock of Drop Press Patterns in the country—suitable for Forging, and all kinds of Sheet Metal work.

**WHY THE BEST:**

It requires less power, works faster, gives a harder blow with same weight of hammer, the rebound of the hammer is caught without lessening the force of the blow, the blow is uniform and not affected by variations in the speed of the driver. It is always in order. The Drop Press a specialty.

MILO PECK, New Haven, Conn.

## The Ausable Nails

Are Hammered Hot,  
 And the Finishing and Pointing are Done Cold,

Thus Imitating the Process of Making Nails by Hand.

Quality is **Fully Guaranteed.**

For Sale by all Leading Iron and Hardware Houses.

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Improved Boiler Plate Bending Rolls,  
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Attachments furnished for punching Nuts and Washers complete at one stroke.

Rotary Shearing Machines, Steam Engines, with Teal's Balance Slide-Valves.  
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TRADE MARK  
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The Original Inventors and Manufacturers of the  
**OSBORN BRIGHT METAL CAGES.**  
Also OSBORN & DRAYTON Improvements under  
twelve different patents. We are continually bringing  
out new and beautiful designs to meet the demands of  
refinement and taste.  
ALVAN DRAYTON, General Agent.

**JOHN MAXHEIMER,**  
Manufacturer of  
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**BIRD CAGES,**  
247 and 249  
Pearl Street,  
NEW YORK.



Patented June 8, 1862;  
April 6, 1869; Dec. 23, 1873;  
Jan. 20, 1874; Dec. 22, 1874;  
April 20, 1875.



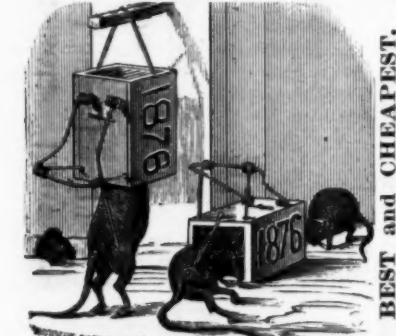
**WATERS' IMPROVED  
Pruning Implements**



Are made of best steel  
on scientific principles.  
Light, practical, dura-  
ble, cheap.  
Has no competitor  
for public favor, as  
thousands can testify.  
See same in Agricul-  
tural Hall, Centennial,  
Philadelphia, Column  
T. No. 25.  
Orders for fall trade  
should be made early.  
Manufactured only in  
this city.  
Send for circular and  
price list.

**E. S. Lee & Co.,**  
ROCHESTER, N. Y.

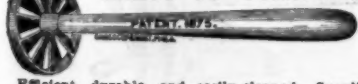
**1876.  
ANIMAL TRAPS**  
Made by  
**THE SELLERS MFG. CO.,**  
707 Market Street, Philadelphia, 83 Reade  
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Mailed prepaid on receipt of 50 cents.  
For sale by all **HARDWARE JOBBERS.**

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COMMISSION MERCHANT,  
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Manufacturers' Supplies.  
No. 14 Murray St., New York.  
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**Crane's "76" Potato Masher.**



Efficient, durable, and easily cleaned. Supplied to  
the trade only. Samples sent free to responsible  
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Water, Air, and  
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Rear of 241 Arch St., Philadelphia.

# AMERICAN SCREW CO.,

Providence, R. I.

Manufacturers of

## IMPROVED Gimlet Pointed Wood Screws, Patented

May 30,

**1876.**

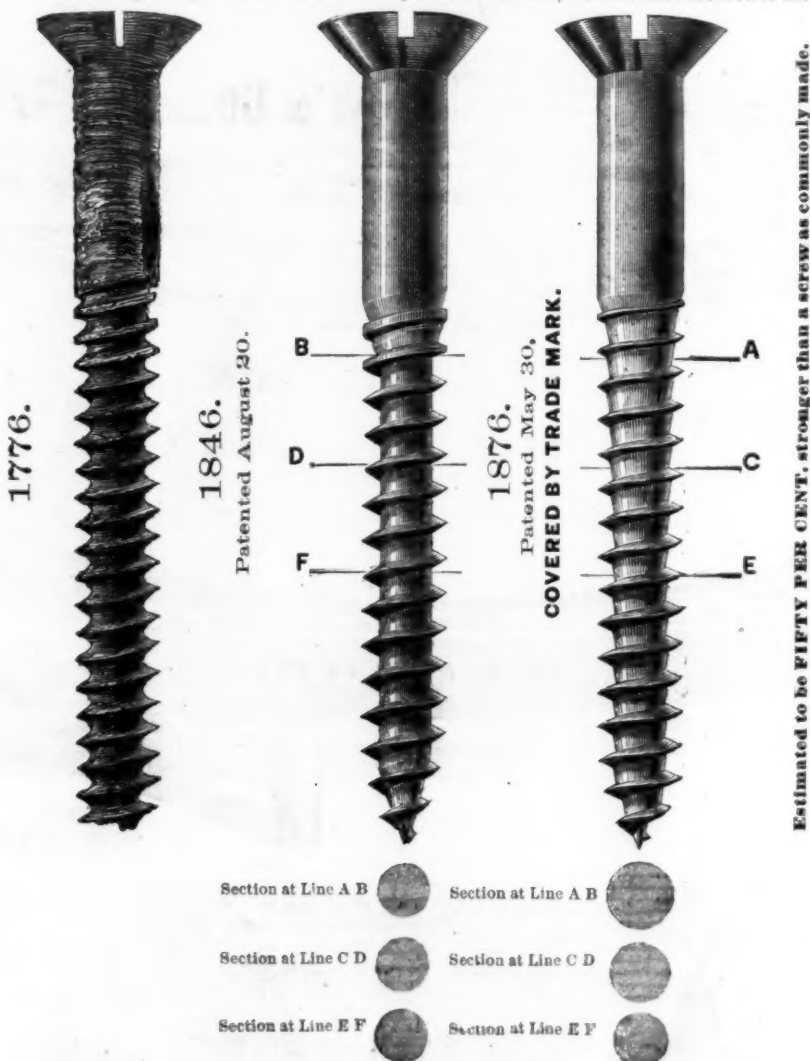


After forty years' experience we offer to the trade our Centennial Screw, pat-  
ented May 30, 1876, as the best we have ever known.

The method of manufacturing is also patented, and we are changing our  
machinery as fast as possible, to manufacture the improved article only. To intro-  
duce them, they will be sold at same price as the old style screw.

The new screws will be packed in manilla colored boxes with new label covering  
end of box, and enlarged figures showing plainly contents.

To distinguish this screw we have adopted a trade mark, which is also secured to us.



Estimated to be FIFTY PER CENT. stronger than a screw as commonly made.

The above drawings show the progress of screw making from the old blunt  
point to style now adopted.

Experience has shown that the weak point of screws, as formerly made, is at the  
heel of the thread, where all the strains of forcing the screw into the wood naturally  
concentrate.

To avoid the sharp angle existing in the old style of screws has been the aim of  
all manufacturers, but every expedient hitherto adopted has proved as objectionable  
as the evil complained of.

It will be seen in our new screw that not only is the sharp angle avoided, but  
the strength very much increased, as illustrated above. See sections at lines.

### CLAIM.

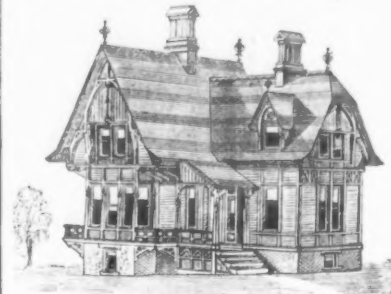
"A Pointed Wood Screw having the outer periphery of the thread upon its body  
cylindrical, while a portion of the body below the thread and near the neck is conical,  
the remainder of the body to the point being cylindrical, and yet having all the thread  
brought to an edge of a constant angle, without jogs in the paths between the threads,  
substantially as described."

WOOLLETT'S

VILLAS AND COTTAGES;

res for All.

A Book for the People.



Reduced view of Perspective Plate 38.

Showing Plans, Elevations and Views  
of Twelve Villas and Ten Cottages.

Being a collection of Dwellings suited to various  
individual wants, and adapted to different locations.  
Designed by

**WM. M. WOOLLETT,**

Fellow of the Am. Institute of Architects.

### LIST OF ILLUSTRATIONS.

- | Design. | Plate. | No. No. | VILLAS.  |
|---------|--------|---------|--|
| 1       | 1      | 1       | Basement, 1st and 2d story plans of Frame Villa. Scale indicated on plate. |
| 1       | 2      | 2       | Perspective view.  |
| 2       | 3      | 3       | Perspective view, Frame Villa House. Plans similar to Design No. 1.        |
| 3       | 4      | 4       | 1st and 2d story plans of a Brick Villa. Scale indicated on plate.         |
| 3       | 5      | 5       | Front elevation of Villa. Scale indicated on plate.                        |
| 3       | 6      | 6       | Perspective view.  |
| 4       | 7      | 7       | Ground and 2d floor plans of Brick Villa. Scale indicated on plate.        |
| 4       | 8      | 8       | Perspective view.  |
| 5       | 9      | 9       | 1st and 2d floor plans of a Frame Villa. Scale indicated on plate.         |
| 5       | 10     | 10      | Front elevation.   |
| 6       | 11     | 11      | 1st and 2d story plans of a Frame Villa.                                   |
| 6       | 12     | 12      | Perspective view.  |
| 7       | 13     | 13      | 1st and 2d story plans of a Frame Villa.                                   |
| 7       | 14     | 14      | Front elevation.   |
| 8       | 15     | 15      | Perspective view of a Villa. Plans similar to Design 7.                    |
| 9       | 16     | 16      | 1st and 2d story plans of Brick Villa. Scale indicated on plate.           |
| 9       | 17     | 17      | Perspective view.  |
| 10      | 18     | 18      | 1st and 2d story plans of a Brick Villa. Scale indicated on plate.         |
| 10      | 19     | 19      | Perspective view.  |
| 11      | 20     | 20      | Perspective view of Brick Villa. Plans similar to Design 10.               |
| 12      | 21     | 21      | 1st and 2d story plans of Frame Villa. Scale indicated on plate.           |
| 12      | 22     | 22      | Perspective view.  |

### COTTAGES.

- |    |    |    |  |
|----|----|----|--|
| 1  | 23 | 23 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate.           |
| 1  | 24 | 24 | Perspective view.  |
| 2  | 25 | 25 | Perspective view of a Frame cottage. Plans same as Design 13.                  |
| 3  | 26 | 26 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate.           |
| 3  | 27 | 27 | Front elevation.   |
| 3  | 28 | 28 | Perspective view.  |
| 4  | 29 | 29 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate.           |
| 4  | 30 | 30 | Perspective view.  |
| 5  | 31 | 31 | 1st and 2d story plans of a Brick Cottage. Scale indicated on plate.           |
| 5  | 32 | 32 | Perspective view.  |
| 6  | 33 | 33 | 1st and 2d story plans of a Brick Cottage. Scale indicated on plate.           |
| 6  | 34 | 34 | Perspective view.  |
| 7  | 35 | 35 | 1st and 2d story plans of a Frame Cottage. Scale indicated on plate.           |
| 7  | 36 | 36 | Perspective view.  |
| 8  | 37 | 37 | Perspective view of Cottage. Plans similar to Design 7.                        |
| 9  | 38 | 38 | Perspective view of Cottage. Plans similar to Design 7.                        |
| 10 | 39 | 39 | 1st and 2d story plans of a Brick and Frame Cottage. Scale indicated on plate. |
| 10 | 40 | 40 | Perspective view.  |

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issued, adapted to the public wants. One vol., ob-  
long 8 vo., of forty 8x12 plates. Cloth; price, \$3.00.  
For sale by

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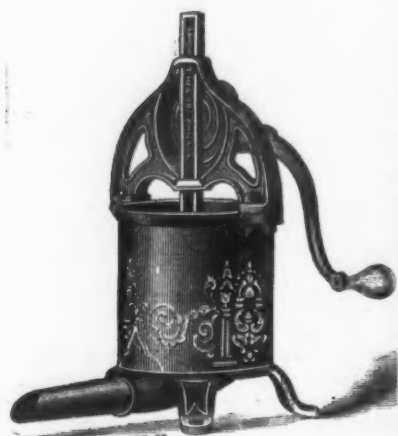
Sent, postpaid, on receipt of price.



# Works of ENTERPRISE MANUFACTURING CO. of PA.,

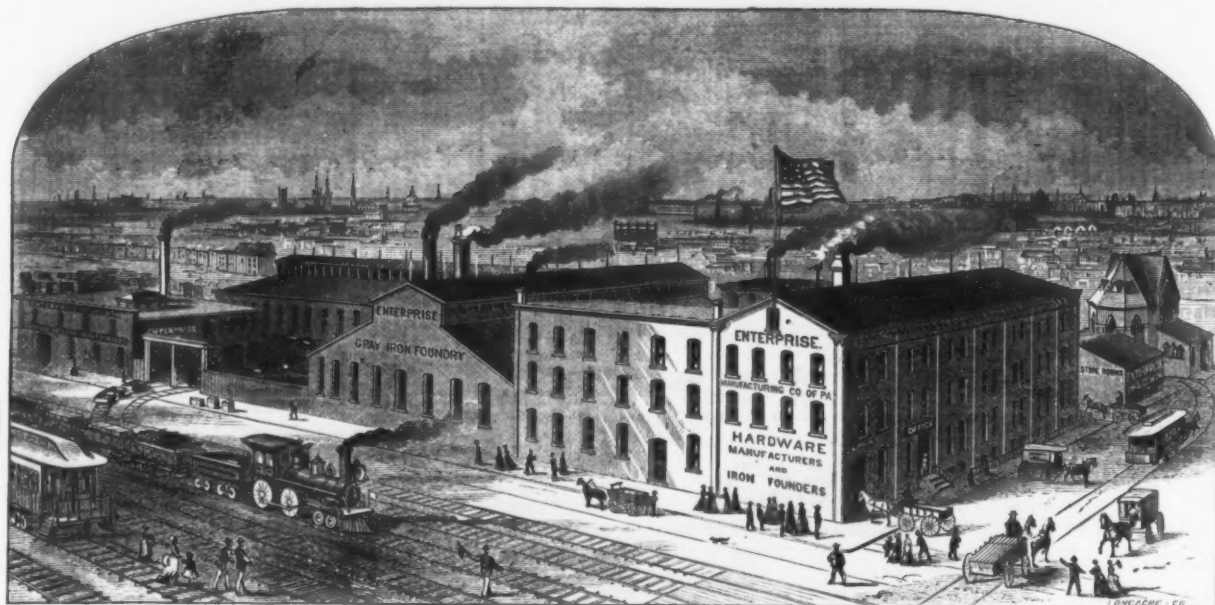
S. W. Cor. American & Dauphin Sts., Philadelphia.

## PATENTED HARDWARE MANUFACTURERS.



SAUSAGE STUFFER.—Closed.

Showing Sausage Stuffer, Fruit, Lard and Jelly Press closed.

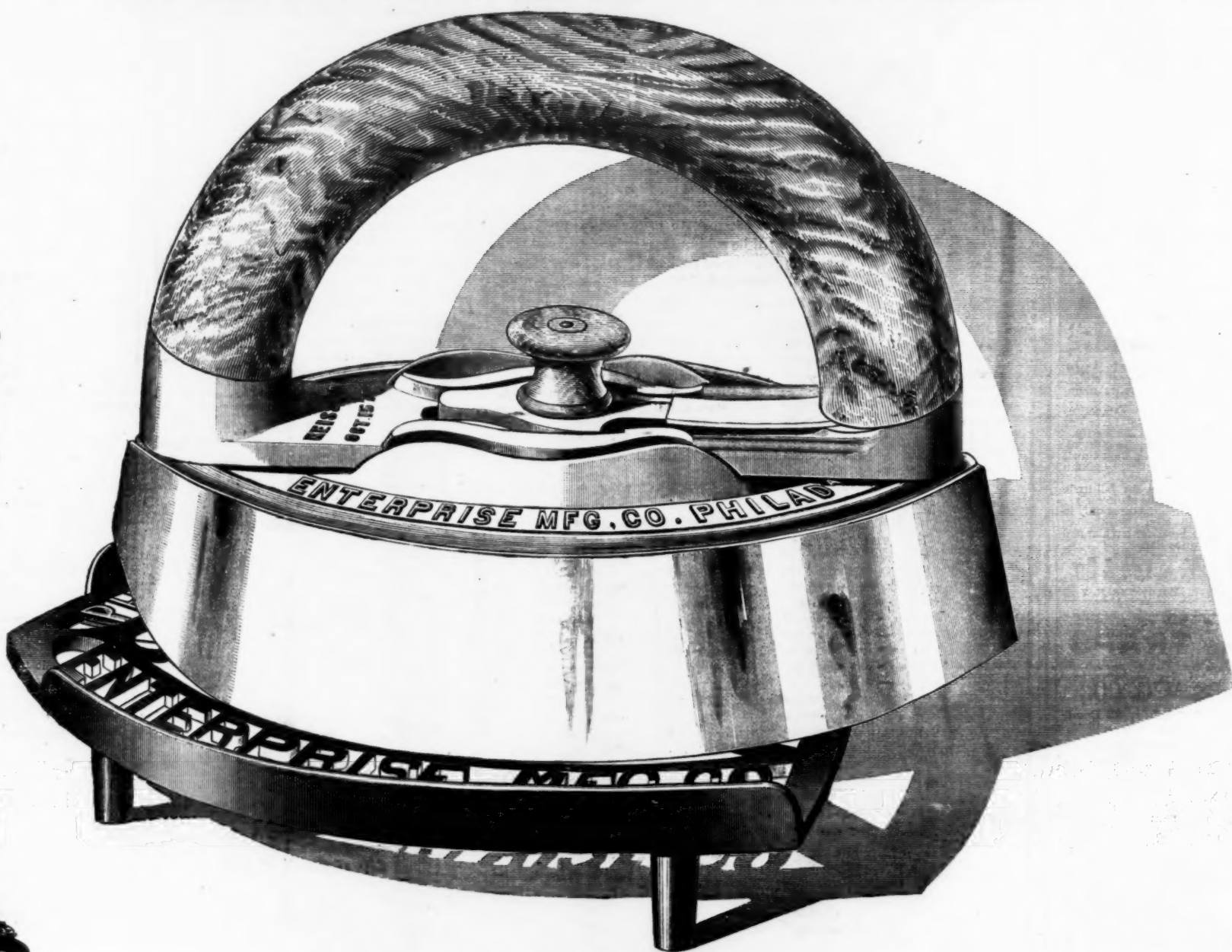


SAUSAGE STUFFER.—Open.

Showing Sausage Stuffer, Fruit, Lard and Jelly Press open.

### MRS. POTTS' COLD HANDLE, DOUBLE POINTED SMOOTHING AND POLISHING IRONS.

They require no holder or cloth, are lined with non-conducting fire cement, and ground by patent improved machinery. They are of various styles and prices.

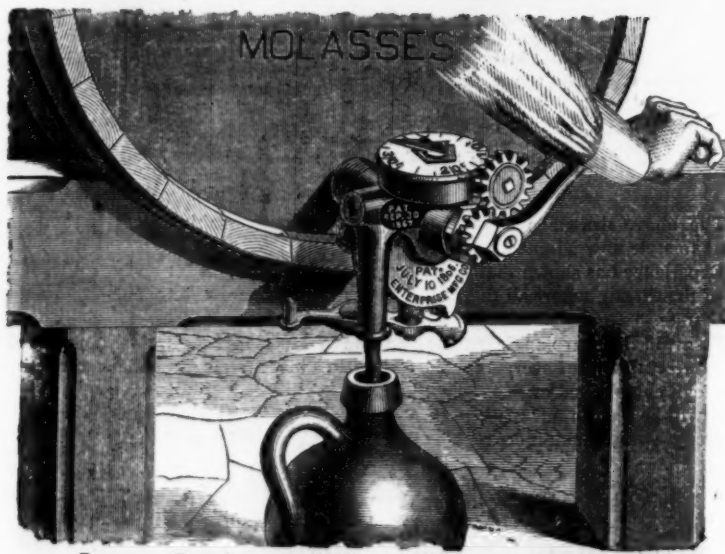


Three irons, one handle and a stand constitute a set. They are furnished either nickel plated or plain polished, as desired. These irons are patented both in the United States and Europe.



American Coffee and Spice Mills.

Twenty different sizes, from \$2 to \$100 each.



Patent Suction and Force Measuring Faucet.

Warranted to measure correctly, and draw a gallon of the heaviest molasses in winter in one minute.



Self Weighing Cheese Knife and Cover.

Weighs and cuts the cheese at the same time—keeps it free from flies and dirt.

Send for Illustrated Catalogue and Price List, describing these and other valuable articles.



## Product of Precious Metals in 1876.

As Wells, Fargo & Co. are the sole carriers of the gold and silver product of the Pacific States, they should constitute the best authority on its amount. With an intelligent regard for the importance of correct statistics of this movement, Mr. J. J. Valentine, the superintendent of that company, has for years past enforced stringent regulations with a view to procuring an exact valuation and record of all the gold dust and gold and silver bullion that passes through the company's hands, as well as what small amounts may be carried through other sources. The returns of Wells, Fargo & Co. have therefore been very properly regarded as the best available evidence of the production of the precious metals, and they doubtless make an approximation to the truth sufficient for all practical purposes. Mr. Valentine's statement of the production coming to market from the States and Territories west of the Missouri River during the year 1876 is as follows:

States and Territories.	Gold Dust and Bullion by express.	Gold Dust and Bullion by freight.	Silver Bullion by express.	Silver Bullion by freight.	Ore and Base Metals by freight.	Total.
California	\$1,635,073	\$1,463,536	\$796,308	\$1,710,940	\$1,613,877	\$7,219,734
Nevada	230,893	22,000	41,785,802	4,312,079	41,286,774	47,837,668
Washington	34,702	5,670	1,673,361	1,673,361	1,673,361	3,346,722
Idaho	1,982,222	996,414	291,065	3,207,092	2,777,092	6,176,389
Montana	1,986,023	195,053	271,824	3,820,000	3,207,092	6,298,916
Utah	47,780	4,779	781,383	3,820,000	3,207,092	6,298,916
Arizona	4,779	4,779	3,820,000	3,820,000	3,207,092	6,298,916
New Mexico	100,000	100,000	3,820,000	3,820,000	3,207,092	6,298,916
Colorado	100,000	100,000	3,820,000	3,820,000	3,207,092	6,298,916
British Columbia	1,810,510	181,051	1,000,000	1,000,000	1,111,992	4,002,553
	\$11,301,427	\$2,899,080	\$11,000,004	\$11,309,534	\$10,876,173	\$37,314,188

This statement, it will be observed, does not profess to state anything beyond the value of the unparted bullion, and therefore gives no accurate idea of the actual product of either gold or silver. Mr. Valentine has therefore undertaken to estimate the proportions of gold and of silver respectively in pure bullion and of the quantity of lead and copper in the base bullion. For the purpose of this estimate, he takes the product of the Comstock Lode and of the whole of Nevada as a standard, and reaches this conclusion: "In round figures, of \$37,000,000 produced from the Comstock Lode this year, \$17,125,000, or quite 46 per cent., was gold; of the whole product of Nevada, 35 per cent. was gold, and of the total silver product, so-called, \$18,647,925, or 31 per cent., was gold. The gross yield is constituted as follows: Gold, \$44,328,501; silver, \$41,506,672; lead and copper, \$5,040,000—\$90,875,173." Applying the ratios thus obtained to the product of each of the last six years, Mr. Valentine obtains the following as the annual production of gold and silver and of the base metals:

Year.	Product.	Lead.	Silver.	Gold.
1871	\$38,354,000	\$2,100,000	\$30,250,000	\$35,898,000
1872	68,236,000	2,250,000	30,587,500	39,486,000
1873	72,338,000	2,450,000	38,352,100	40,456,000
1874	74,401,045	3,800,000	30,498,000	40,103,045
1875	80,889,057	5,100,000	31,043,910	41,745,147
1876	90,875,173	5,040,000	41,506,672	44,328,501

Mr. Valentine takes the following important exceptions to the statements of product issued in the government reports: "We see no way of reconciling the discrepancy between \$66,000,000 gold and silver published as the estimate of United States officials for 1870 and \$56,184,000 shown here for 1871, which was a more productive year by at least 4,000,000 than 1870. We are confident that similar discrepancies or exaggerations as to the product of the United States exist in the estimates usually accepted for the years from 1870 to 1861 inclusive, and possibly all the way back to 1848." We are quite disposed to think there is good ground for this criticism; for the government reports of production and import combined show a surplus of supply over exports so large as to be wholly irreconcilable with any reasonable estimate of the home consumption for the arts and manufactures.

The following is given by Mr. Valentine as the product of gold and silver in the United States each year from the date of the California discoveries to the present period:

	Gold.	Silver.
1849	\$40,000,000	.....
1850	50,000,000	.....
1851	56,000,000	.....
1852	60,000,000	.....
1853	65,000,000	.....
1854	60,000,000	.....
1855	55,000,000	.....
1856	55,000,000	.....
1857	55,000,000	.....
1858	50,000,000	.....
1859	50,000,000	.....
1860	45,000,000	.....
1861	43,000,000	1,500,000
1862	50,000,000	3,000,000
1863	40,000,000	7,000,000
1864	45,000,000	10,000,000
1865	55,000,000	11,000,000
1866	55,000,000	10,000,000
1867	51,500,000	13,000,000
1868	48,000,000	12,000,000
1869	49,500,000	12,000,000
1870	50,000,000	18,000,000
1871	55,998,000	20,256,000
1872	59,459,429	20,527,500
1873	60,456,593	26,352,100
1874	60,103,045	30,498,000
1875	61,745,147	31,043,910
1876	64,328,501	41,506,672
	\$1,350,490,745	\$273,314,188

It will be seen that, since 1864, there has been a steady tendency toward a decrease in the gold yield and an increase in the production of silver. In 1865 the product of gold was \$53,000,000 and of silver \$11,000,000; last year, the yield of gold was \$44,328,500, and of silver \$41,506,672. This result is due mainly to the great Nevada discoveries; how long they may hold out and maintain this change in the relative supplies of the two metals is wholly a

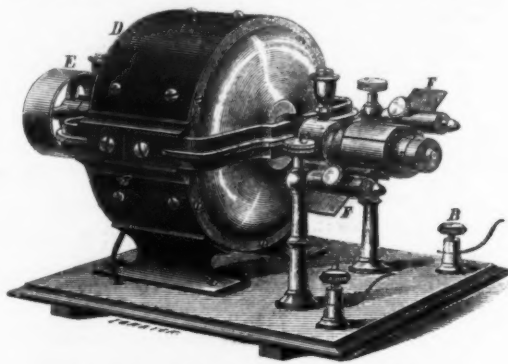
matter of conjecture; but it cannot be doubted that the variation of relative product that has occurred within the last few years has largely contributed to the late fluctuations in the price of silver.

## The Weston Dynamo-Electric Machine.

The superior economy and many other advantages of dynamo-electric machines over batteries for the electro-deposition of metals have rendered these machines much inquired after. We illustrate herewith the Weston dynamo-electric machine, especially adapted to the use of electroplating establishments. It is manufactured by Messrs. Condit, Hanson and Van Winkle, of Newark, N. J. The cylinder D, forming the outside of the machine, is attached to a walnut base. From the interior of this cylinder a number of magnets project toward the axis; these are covered with insulated wire. The magnets are so connected that the poles are alternately north and south. In the center space a shaft connected to the pulley E, is furnished with a series of armatures made in segments, covered with wire, and firmly secured to the shaft. When the shaft is revolved so as to carry the armatures very rapidly past the electro-magnets, which have already been charged, currents of electricity are induced in the wires surrounding the magnets.

As these currents are constantly changing their direction, a device called a commutator has to be used. The one used on this machine is very simple in construction, consisting of but two pieces of metal, requiring only two springs to carry the currents from all the armatures. The springs used, F F, are of thin, hard rolled copper, fixed in adjustable clamps, supported on brass clamps.

When the apparatus is first made the electro-



THE WESTON DYNAMO-ELECTRIC MACHINE.

magnets are for a moment connected to a battery, or other source of electricity, which charges the steel plates and renders them permanently magnetic. Now, if a belt from any source of power be put on the pulley E, and the armatures are set in motion, weak currents will be induced in the wires surrounding the armatures, which are picked up by the springs, F F, and carried to the two pillars. If the two wires N N, leading from the coils of the electro-magnets be placed in contact with these pillars, the weak currents from the armatures will pass around the electro-magnets and will strengthen them; this will again increase the strength of the currents induced in the armatures, and so on, until a maximum is reached. To utilize the currents from such a machine it would be simply necessary to place the work to be done in circuit with the electro-magnets and armatures, so that the currents induced in the armatures may pass through that circuit and through the coils of the electro-magnets.

But such a machine would have very limited applications. It could not be used for electroplating, electrotyping, and the other purposes of electro-metallurgy, as the currents resulting from the "polarization" of the electrodes in the vat would, when the speed of the machine fell below a certain point, reverse the polarity of the electro-magnets and the direction of the current, undoing what it had previously done and spoiling the work.

Some of the leading peculiarities are as follows:

An iron ring or shell is used to which all the magnets are attached. One circuit and one shaft only is used, dispensing with the use of extra commutators and brushes. The currents from all the armatures are picked up by two brushes and sent round the electro-magnets. The armatures are constructed entirely of iron. The commutator is outside the bearings. The parts liable to be injured by dirt and oil are thoroughly protected by the nickel-plated cover. The machine has an automatic switch. The armature is constructed with loose-shaped segments. The parts subject to wear are interchangeable, and can be replaced in a few minutes. In proportion to its power it is both small and light. The ring uniting all the electro-magnets secures an equalization of the magnetic field, and balances the strains upon the armatures and shaft, thus reducing the wear and tear of the machine.

The commutator is placed outside the bearings, and it is not necessary to remove the bearings in order to clean it.

**An Old Indenture.**—The following is a copy of an apprentice's indenture to the cutlery trade in England less than seventy years' ago. Times have changed since then, and so have boys: By indenture dated 25 July, 1708, John Curtois, son of Thomas Curtois, of Cunbarr, co. York, husbandman, was bound apprentice to Joseph Beal, of Pittamoor, in the parish of Sheffield, cutler, for 9 years, wages 16 pence per year. Among the covenants it is stipulated for the apprentice: "Fornication he shall not commit nor matrimony contract. Taverns or ale-houses he shall not frequent, at dice, cards or any other unlawful game or games he shall not play, nor absent himself from his said master's service by night or day without

ye consent and leave of his said master, nor do, or assent unto anything whereby his said master may by any means be damaged. But in all things, as a good and faithful apprentice and servant, shall gently and dutifully demean and behave himself during ye said term." The master agrees to chastise the lad "reasonably."

## Mechant Iron at the Centennial.

(Continued.)

The display of GRAFF, BENNETT & CO., Pittsburgh, in the Government Building, though small, was to iron workers one of the most interesting in the whole Exhibition, as it showed the results of, at present, the only thoroughly successful machine puddling ever done. It was entered to show the iron used in the experiments now making at Springfield in remodeling our old cast iron ordnance. The iron was the product of the Danks' furnace from the Millvale Works, of the above named gentlemen, and consisted of a puddle ball weighing 3034 lbs., a bloom 1992 lbs., and two puddle bars of 1668 lbs. each. These were not made by welding, but were the results of single heats. In addition there were samples of square iron from 1½ inches to 2 inches, and samples of iron from one seven thousandth of an inch in thickness to less than one eighteen thousandth. Two sheets were shown so thin that it would require 18,550 to make an inch. These sheets were rolled from puddled bar without reworking on a set of Lanth's 3-high plate rolls, 36x43 inches. The iron made from these furnaces is being used for links in a bridge building near Pittsburgh, and repeated experiments have shown that bars made from the common coke irons of the Pittsburgh regions have

quality of iron. This firm has the advantage over most other nail works for producing nails of uniformly good quality, as they make their own pig iron from such ores as are best suited for this purpose.

In connection with the exhibit of W. D. Wood & Co., in the Main Building, which we have already noticed,

ALAN WOOD &amp; CO.,

of the Delaware and Schuylkill Iron Works, made a very beautiful and interesting display of sheet iron. At one side of the display on the division line between it and the next one, and extending from one aisle to the next, was a large arch supported on pillars made of galvanized iron from their works. All the elements of the pillars and arch were stamped in the metal, the pedestal, base, shaft, with panel, capital and entablature being accurately represented, and the stamping being done without a flaw. Under the arch on the division board were shown full sized sheets of black and galvanized sheet irons of their several brands, all 23x28x96, and weighing 112 lbs. They also showed some fine samples of shovel iron. This firm is one of the largest in the country, having an annual capacity, at their 10 mills, of 16,000 tons of sheet and plate iron. They pay especial attention to galsholder, pan and elbow, shovel, tack, last, stamping, ferrule, head light and jacket iron.

The display of the

WYANDOTTE ROLLING MILL,

in the Mineral Annex, was by no means as complete and excellent as they were capable of making, and though the iron shown was evidently of a superior quality, it was not attractively displayed. The most important part of their exhibit was the iron made by the Hay process, which gives a metal remarkably free from phosphorus and sulphur, very homogeneous and of great tensile strength. The process consists in the use, in the puddling furnace, of about 5 per cent. of a peculiar iron sponge. This sponge is made in a cupola furnace from ore scrap and clay, the shell being wound with a long coil of iron attached to a heavy galvanic battery. The product tapped from the furnace resembles clinder, or "bull dog," is pulverized and mixed with the charge in the puddling furnace, as before stated. The results of its use are really surprising, even clinder pigs giving a strong iron of great purity. The process is worthy of attention, and we regret that the Wyandotte Rolling Mill did not give a more complete display, with records of material used and results obtained, together with tests, both mechanical and chemical.

CARTWRIGHT, M'CURDY &amp; CO.,

Enterprise Hoop Mill, Youngstown, O., made an exhibit in the Main Building of their hoops of various sizes. The loose pieces, which were bent back and forth by almost every one who had stopped to examine the display, were sufficient evidence that the reputation of this firm for the quality of their goods is not undeserved.

Among the exhibits of Ohio in the Mineral Annex were some good samples of sheet iron exhibited by

L. B. WARD,

Niles, O. The samples were all boiled iron, not made from knobbled iron, and the specimens of work from it show its quality to be excellent. There were samples of stamped pans, stove pipes and flanging that were very good; also sheets, 27x24x84, weighing 131 lbs., 136 lbs. and 125 lbs. The sheets were all made from Andrews & Hitchcock's close gray black band pig iron.

THE INDIANAPOLIS ROLLING MILL CO.

exhibited in the Mineral Annex to the Main Building, in connection with the exhibit from Indiana, samples of coke, pig and iron rails. This is one of the few rail mills in the West that has not succumbed to the panic, but has kept in operation almost constantly.

NEW ALBANY IRON WORKS

made a display, in connection with the Indiana exhibit in the Mineral Annex, of a variety of articles of their manufacture, such as muck bar, spikes, nails, channel iron, bars of various sizes, bent and twisted, both hot and cold.

VAN ALLEN &amp; CO.,

of Northumberland, exhibited, in connection with the collective display of C. W. & H. W. Middleton, at T 66, Main Building, 85 sizes and kinds of cut nails and spikes. These were simply placed on exhibition, and not for competition. In addition to nails, this firm make muck bars, having an annual capacity of 5500 tons muck bar, 4000 tons nail plate and 2500 tons nails. Their mill has 21 nail machines.

THE PERU STEEL AND IRON CO.,

Clintonville, N. Y., exhibited in the Main Building samples of the Palmer ore, both in mass and separated, a loop of iron weighing 480 lbs. and shingled loop of 450 lbs.; also three samples of Peru billets, with nail rods and horseshoe nails made from the same.

New Caledonia has export about 2000 tons of nickel since the discovery of nickel ore at Mont d'Or in 1874. The ore is found in various localities, but the hopes of an extensive product raised by its wide distribution have not been realized. According to the account the product so far has been distributed as follows: The Boz Kaine sends away from Canala to Germany every month about 125 tons; the Bel-Air mines at Oualahave raised 1200, of which 160 tons were sent to London at the beginning of 1875. In April, 1876, 550 tons were shipped for Havre, and in May, 480 tons. The remaining mines, all told, including the Palma mines, have not sent away more than an aggregate of 100 tons. The use of nickel in manufacturing is daily increasing. Its application to exposed metal work is most extensive, and its fine luster, durability and cheapness, increases its uses for ornamental purposes. The only deposit of nickel worked in the United States is in Lancaster county, Pennsylvania, where the ore is mined by blasting.

## The Centennial in England.

At a meeting in London of the British Society of Arts, on the 30th ult., Prof. Archer, the British Executive Commissioner to the International Exhibition at Philadelphia, read a paper on the Centennial, of which the London *Morning Post* gives the following report:

The exhibition took its origin from the desire of the Americans to celebrate in some expressive and significant manner their Centennial anniversary, and the deep-seated love which exists in the hearts of most Americans for the memory of our lamented Prince Consort had no small share in leading them to choose what he considered a festival of peace and industry as the best means of securing the co-operation of all other nations in their national thanksgiving. The capital required to establish the exhibition was raised by a Centennial stock and a general subscription by each state; and the organization by which it was carried out consisted of an executive and other sub-committees, including the Women's Committee, which organized a special exhibition for the proper display of women's work, which formed a unique and interesting feature in the general plan. The buildings were erected in the great public Fairmount Park. The Professor then proceeded to give an account of the Exhibition itself, and its prominent characteristics. In the Women's Pavilion some contributions by our own gracious Queen and Royal Princesses were especially prized, and gave great satisfaction to the management. In the Main Building England and her colonies occupied by far the largest amount of space, while the United States had nearly double as much room.

As a general rule the American exhibits were of such excellent quality and so carefully displayed that the exhibitors were evidently alive to the vast importance of the competition. No one who had only seen their weak efforts in the European exhibitions could have expected such superior manufactures in metal work, textiles, and especially in chemicals, which were shown by them. As to the general success of the Exhibition there could be no doubt. The attendance far surpassed that of any previous exhibition—the total admissions being—cash admissions, 8,004,274; free, 1,906,692; total, 9,910,966; while the visitors at the London Exhibition of 1862 numbered 6,211,103, and of Paris (1867) 9,300,000. Those results proved that international exhibitions were not played out, but had still a very important part to perform in advancing commercial prosperity and the general interest of civilization. After bearing testimony to the unbounded hospitality of the Philadelphians and to the widespread kindness of feeling for England and Englishmen, he remarked that he believed that the effect of the Exhibition on America would be most beneficial. The great cities had received a wholesome and powerful stimulus to strive in the race for higher culture and more æsthetic feeling, and with the general public from all parts the effect would have been to dispel innumerable errors, prejudices and false estimates. Let them hope that their American brethren might realize these and every other possible good from so well conceived and splendidly managed an undertaking as that which they had just so successfully completed.

The chairman said that the Exhibition of Philadelphia was, without exception, the greatest exhibition ever held in the world, and it had constituted a happy means of celebrating the centenary of American independence. It was exceedingly appropriate to have such a paper as Professor Archer's read before this society, for in that hall, under the auspices of Prince Albert, the great movement was started which resulted in the Exhibition of 1851, and the society's initiative had been followed by many of the civilized nations of the world. He, the speaker, visited Philadelphia a few years ago, but he did not stay long enough to see much of the place. He, however, saw the great Fairmount Park, which was 12 or 13 miles round, and, being intersected by rivers, the scenery was very beautiful. There could not have been a better place for the Exhibition. The Americans take up things in a wonderful way; they like to do them on a giant scale, and they certainly succeed. As to their hospitality, they gave free passes from one end of the Union to the other; they entertain visitors at their houses and their hotels in a most lavish manner; they like to make a Britisher feel free of the country, and there was a real good feeling toward this country underlying all their talk. Indeed there was a strong undercurrent of love for England in America, and it was especially concentrated on Queen Victoria. If Her Majesty could visit America there would be no bounds to the expressions of respect and affection that the Americans would pay her.

After a few remarks by Messrs. Hyde Clark, Botley, Cook, Brown and others, the proceedings terminated.

Mr. John Ellison, a wealthy ironmaster, of Ironton, Ohio, died at that place a few days ago. He was born near Manchester, Adams county, Ohio, August 18, 1806, and was consequently a little over 70 years of age, a fact that suggested the text for the funeral sermon, 30th Psalm, 10th and 12th verses. He moved to Lawrence county in May, 1830, first stopping at Hanging Rock where he kept the warehouse for a couple of years. He then went to Pinegrove Furnace, which he managed until 1843, most of the time possessing a rental interest. In that year he moved to Jackson Furnace, which, in company with M. R. Tewksberry and Jas. Richey, he purchased. He managed that furnace until 1846, and cleared considerable money, then sold the furnace for a good deal more than was paid for it. In 1846 he came back to this county and went into Edna and Veauvius furnaces with Messrs. Rodgers and Dempsey, the firm being Dempsey, Rodgers, & Ellison. At Edna he remained until about three years ago, when he purchased a residence and moved to Ironton.











This will be a matter of time, but it will doubtless come. Our quotations will be found on page 24.

## EXPORTS

Of Hardware, Iron, Machinery, Metals, &c., from the Port of New York, for the Week ending January 9, 1877:

Hamburg.	Quan. Value.	Hdw. cs.	Quan. Value.
Hardware, cs.	64 \$1,332	Nails, kegs.	80 98
Pumps, pkgs.	3 75		
Ag. imp., pkgs.	30 1,591		
Copper, pkgs.	54 15,000		
<b>Bremen.</b>			
Hardware, cs.	7 510		
Pumps, pkgs.	3 400		
Ag. imp., pkgs.	35 3,780		
Machinery, cs.	6 186		
<b>Dutch West Indies.</b>			
Nails, kegs.	96 90		
<b>London.</b>			
Hardware, cs.	227 3,700		
<b>Liverpool.</b>			
Cutlery, cs.	5 575		
Mach'y, pkgs.	23 1,340		
Hdw., pkgs.	72 2,115		
Wrought, cs.	9 320		
Rifle, case.	1 259		
<b>Glasgow.</b>			
Hardware, cs.	3 307		
Machinery, cs.	20 2,040		
Iron rollers.	41 500		
<b>Canada.</b>			
Tin plate, bxs.	50 228		
<b>British Guiana.</b>			
Hdw., cs.	19 275		
<b>British Australia.</b>			
Ag. imp., pkgs.	51 2,600		
Hdw., cs.	95 3,303		
<b>British Honduras.</b>			
Machinery, cs.	2 125		

## IMPORTS

Of Hardware, Iron, Steel and Metals into the Port of New York, for the week ending January 9, 1877:

Hardware.	Order.
DeKhaas Jos.	Manganese ore, bbls.
Ironware, cs. 3	Boxes, 100
Baker Hermann & Co.	Scrap, tons, 45; cast, tons, 15
Mdse. pkgs., 16	Without Bill of Lading, Sheet, bbls., 162
Fuller Bros.	
Mdse. pkgs., 1	
Law & Garlicks.	
Mdse. pkgs., 1	
McCoy & Co.	
Mdse. pkgs., 5	
Moore's, J. P., Sons.	
Mdse. pkgs., 2	
Merchants' Dispatch Co.	
Arms, cs. 9	
Nichols & Lefevre.	
Arms, cs. 2	
Remington E. & Sons.	
Gun barrels, cs., 8	
Schoverling & Daly.	
Mdse. pkgs., 3	
Wienbach & Hilger Hdw. Co.	
Hdw., cutlery & caps, pkgs., 25	
<b>Order.</b>	
Chains, cs., 34	
Cables, 5	
Nails, cs., 1	
Packages, 12	
Without Bill of Lading, Wire rope, coils, 1	
<b>Iron.</b>	
Hopkins E. T.	
Tubes, 525	
Henderson Bros.	
Pig, tons, 100	
Mdse. pkgs., 28	
Lang W. Bailey.	
Plates, 40	
Bundles, 40	
McCoy & Co.	
Bundles, 22	
Plates, 419	
Marvel W. D.	
Ore, tons, 360	
Merchants' Dispatch Co.	
Tubes, 600	
Naylor & Co.	
Barrels, 60	

## OLD METALS, PAPER STOCK, &amp;c.

We have nothing definite to report in the condition of the market for Old Metals, Rags, Paper Stock and other junk materials during the period that has elapsed since the date of our last. Old Metals still continue dull, and there is little demand from consumers for any description of stocks. Rags and Paper Stock are dull and declining. An occasional large sale is effected, but this is an exception and not the rule, as buyers are holding off, and cannot be induced to purchase any considerable quantity. We quote the following as the current purchasing rates:

**Old Metals.**—Copper, 16c. per lb.; Yellow Metal, 10c.; Brass, 9c.; Composition, heavy, 12c. @ 13c.; Lead, solid, 4 1/2c.; Tin, 10c.; Zinc, 4c.; Pewter, No. 1, 1 1/2c.; do., No. 2, 8c.; Spelter, 5 1/2c.; Wrought Iron, \$21 per ton; Light do., \$10 per ton; Store Plate, \$9 per ton; Machinery, do., \$12 per ton; Burnt Iron, \$4 per ton.

**Rags, &c.**—Linen, 4 1/2c. @ 5 1/2c.; do. Cotton, No. 1, 5 1/2c.; No. 2, 5c.; White, No. 1, 2c.; No. 2, 1c.; Colored, do., 2c.; Mixed, Woven, 2c. @ 3c.; Soft, do., 5 1/2c.; Gunny Bagging, 1 1/2c.; Jute Butte, 1 1/2c. @ 2c.; Newspaper Stock, 2 1/2c.; Waste Paper and Scraps, 1 1/2c.; Kentucky Bale Rope, 4c.; Oakum Junc., No. 1, 4 1/2c. @ 5c.; do. No. 2, 3c.; Tarred Shaking, 1c. @ 1 1/2c.; Grass Rope, 3c.

## PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., PHILADELPHIA, Jan. 9, 1877.

The business prospects are not essentially changed since our last, and there is about the same uncertainty as before. The weather has been unusually severe, the streets blockaded with snow, and the river all but closed with ice. It would be impossible to move any quantity of goods in the present condition of affairs, either by land or water, and the snow and ice seem as though they had come to stay. We are sorry to say, however, that there is no great demand for transportation, and general business is about as dull as it ever has been. Still, our merchants are hopeful as ever, and accept the position with commendable cheerfulness, having the strongest confidence in the future. We cannot learn of any new business of special

importance. There is a fair activity in some of the iron shipbuilding yards, and prospects of others joining in toward spring. A contract for 3000—probably 3000—freight cars for the Pennsylvania Railway Company is about to be given out, and we understand a similar order for the Lake Shore Road will be placed in one of the Western cities. This indicates that the railways are about renewing their rolling stock, and we are also informed that there is more doing in bridge building, with prospects in other directions of such additions as the finances of the roads will permit. The misfortune is, that they are not only impoverished in equipments, but by their system of doing business the last 12 months they have impoverished themselves financially, and it is a rare thing now to find any railway company in a position to enter the market as a cash buyer for large amounts.

At a meeting of the stockholders of the Reading Railroad Company, held yesterday, it was shown that the gross earnings of the road for 1876, amounting to \$12,227,511, were \$1,355,708 less than the charges against it for the same period. Some of the less prominent local roads make a fair showing, but there is no doubt the leading roads are in a very unsatisfactory condition, the effect of which is felt severely in many branches of business in this vicinity. The deficiency in the Reading is attributed entirely to the operations of the Reading Coal and Iron Company, and not to the transportation business proper. From the annual statement we learn that nearly \$50,000,000 have been raised during the past 10 years for the use of the Reading Coal and Iron Company, and to this branch must be attributed the present embarrassment of the company.

**Pig Iron.**—Continues in the same unsettled condition as last reported. The demand is said to be very disappointing, although we find, upon close inquiry, that about 4000 tons have changed hands since the first of the year. There is nothing like activity, however, and with offerings in excess of the demand, prices are unsettled and weak. We cannot hear of any sales of No. 1 Foundry for less than \$21, but Gray Forge has been sold at \$18 here, and if offers were made for round lots of Foundry Irons, concessions would doubtless be made sooner than lose a customer. In fact, at the present time buyers have the market pretty much in their own hands, and sellers seem disposed to accept any reasonable offer from first-class buyers. We make no change in quotations, but the indications are that a decline will be established within the next few days. We note from Mr. Swank's statistics, which will no doubt be scrutinized with deep interest, that the reduction in stocks is only about 100,000 tons, while the decrease in production is over 300,000 tons, as compared with 1875, and over 800,000 as compared with 1874. From this it is clear, that unless there is a very important increase in consumption, the furnaces have rather a poor prospect before them. We refer our readers to Mr. Swank's detailed statement, which will be found on another page, a perusal of which will throw more light on the present condition of the iron trade, than anything we can say. There are rumors of additional furnaces going into blast, and it is likely that several will do so at an early date. In the meantime, the Plymouth, at Conshohocken, will blow in one this week, and Seyfert, McManus & Co., will also put one in blast in a few days. We cannot learn anything definite in regard to others, but in our next we will probably be able to report a further addition to the number. What the result will be it is difficult to predict, in the meantime there seems to be nothing to warrant an increase of production, but it is safe to say it will have the effect of reducing prices. If lower prices enables our iron working establishments to get to work, it may eventually prove a real benefit to the trade at large, but we cannot hear of any business offering likely to absorb any important amount of iron. From present indications it seems as though we should have a lower range of prices without any increase in consumption. We quote: No. 1 Foundry, \$21; No. 2, do., \$19 to \$19.50; Gray Forge, \$18 to \$19, with a very weak and unsettled feeling throughout.

**Blooms.**—There has been no business doing the past few days, and prices are nominal. In case of pressure to sell, a considerable reduction would have to be accepted to secure a buyer while under a necessity to purchase, the following rates representing latest sales would have to be paid, price according to quality. Charcoal Scrap Blooms, \$45 to \$47; Charcoal Ore Blooms, \$40 to \$42; Charcoal Billets of superior quality, \$55 to \$62; and Bars for converting into steel, made of best Champlain Iron, \$72 to \$75. Strictly Cold-blast Charcoal Blooms, hammered, are quoted \$60 to \$63, and Billets, \$68 to \$70.

**Ores.**—Business continues quiet, sales are on the basis of the following quotations, although the feeling is rather weak: New Jersey Magnetite—Hacklebarney Bessemer Select (Broken), \$3, cash, f. o. b.; Red (washed), for Foundry Metal, \$3.75 to \$4, f. o. b. Port Oram; Magnetic Lancaster Ore, suitable for Anthracite or Bessemer purposes, \$3 per ton, f. o. b. Baumgardner's Station, Pa. Virginia, and Lake Champlain Ores, are entirely nominal, and no recent business is reported.

**Manufactured Iron.**—Bar Iron seems to be duller than ever, and there may be said to be absolutely no demand. The mills are all making a show of running, but they are employed on Skelp, and do not average one day a week on Bars, and at that rate are accumulating stock. The stores appear to compete successfully with the mills as regards price, and in profits, too, if all we hear is true. The local trade say it is impossible for them to make first-class Bars under 2 1/2c., while the stores get their supplies from the West at under 2c., delivered. It is claimed that the Western mills are running pretty full time, and with cheaper labor and

fuel probably have some little advantage in first cost, and that after selling a portion West at a profit, the surplus is sold here regardless of cost. This, we have reason to think, is a fair statement of the case. We have heard of purchases at 1.80c., with freight at 10c., say, 2c. in store for good brands of Merchant Iron. This figure, our manufacturers say, is considerably below cost of production here, and they are willing to let the trade pass them on these terms. A reduction in wages has been accepted at nearly all the mills, and if, as seems probable, a further reduction in Pig Iron is made, we may have a further decline in Bars. In the meantime, there is no demand worth naming; it is not the price that is the obstacle, but there seems to be no demand for iron, and lowering prices does not seem to help matters in the least. In Sheet Iron there is absolutely nothing doing. Skelp is about the only thing that keeps the mills running, and prices are very low. There is a little business doing in Plate Iron, and inquiries would seem to indicate the continuance of a moderate degree of activity. We quote Bar Iron 1 1/2c. to 2c. for ordinary brands, and 2.20c. to 2.25c. for Best Reformed; Tank Iron, 2 1/2c. to 3c. and upward, according to quantity and quality; Skelp, 2 1/2c. to 3 1/2c.; Muck Bars, \$37 to \$39.

**Horseshoe Iron.**—The demand is moderate, and prices without change, say, \$67.50 to \$69 for 1 1/2 and 3/4 %.

**Steel Rails.**—There has been no business of importance since our last, and the general position is unchanged. Buyers are more than usually scarce, and low prices do not appear to attract their attention. Some large transactions have been pending, but we cannot learn of any business being consummated. Lots of a few hundred tons at a time are sold at about our quotations, and one lot of 1400 tons, 40 lb. Rails, is reported sold at \$51 at Perth Amboy. We quote \$50 at mills as the nominal rate, with a disposition to make concessions to buyers for prompt delivery.

**Iron Rails.**—There is no change to note since our last; business is as dull as ever, and nothing to warrant anticipations of any immediate change. Sales are made occasionally of a few hundred ton lots at our quotations, but the mills are generally very quiet. We quote as before, with sales at prices according to quality, the last reported being 400 tons extra quality, at \$38 at mills. We quote ordinary Rails (on a cash basis), \$34.50 to \$36, and standard brands, \$37 to \$38.50.

**Spikes.**—There is very little doing, and prices are without change. We quote: Railway Spikes, 2.25c. to 2.50c., and Mining Spikes, 4 to 4 1/2 by 3/4, 2 1/2c.; 4 to 4 1/2 by 7-16, 3c.; 3 1/2 by 3/4, 3 1/2c.

**Old Rails.**—There is no demand of any importance, and ordinary lots to secure a buyer would have to be sold at our inside quotation. We hear of \$21.50 being offered and refused for a choice lot, but the quality was very exceptional. We quote \$20 to \$22 as a fair average of the market, the price being determined by quality.

**Scrap Iron.**—The market remains as last quoted; demand rather light, as are the offerings also. Choice lots bring full prices, but anything inferior is marked down rather sharply. For good average qualities we quote \$15 to \$17; wrought \$24 to \$26.

**Nails.**—Business continues dull, but there is no change in prices—say, \$2.90 to the trade, and \$3.15 to consumers.

**Tin Plates.**—There is a fair business doing considering the dull season, and prospects indicate a good spring trade. The decline in gold counteracts to some extent the advanced quotations in England, but prices are steady. We quote in U. S. currency as follows: 1 C, 10x14, \$8 to \$8.25; 1 X, 10x14, \$10.25 to \$10.50; Best Charcoal Lead, 28x30, \$15.50 to \$17; other good brands, \$14.25 to \$14.75; good fair, \$13.50 to \$14.50; Bright Tin for Cans, &c., \$6.50 to \$7.25; good Bright Tin, do. \$7 to \$7.37 1/2; Coke, Lead, 14x20, \$6.50 to \$6.75.

**Lead.**—There is no change to report, and since the holidays no important sales have been effected. The feeling is a trifle stronger, however, and the tendency toward higher prices. We quote Domestic at 6.05c. to 6.10c., currency. Foreign dull and nominal at 6 1/2c., gold. Manufactured is steady. We quote: Bar 8 1/2c.; Pipe, 9c.; and Sheet, 9 1/2c., less 10 per cent. to the trade.

**Shot.**—Remains quiet at the following quotations: Drop Shot, 25 lb. bags, 9 1/2c.; do., 5 lb. bags, 10 1/2c.; Buckshot, 25 lb. bags, 10 1/2c.; do., 5 lb. bags, 11 1/2c.; Conical Balls, 25 lb. bags, 10c. per lb.; net; Bar Lead, 5 oz., 3 1/2 lb. and 1 lb. bars, 8 1/2c., less 10 per cent. to the trade.

**Old Metals.**—The demand is very light, and offerings in excess of requirements. We quote: Heavy Old Copper, 16c. to 16 1/2c.; Light Tinned Copper, 14c.; Copper Bottoms, 13 1/2c.; Heavy Red Brass, 13c.; Light Red Brass, 12 1/2c.; Heavy Yellow Brass, 11c.; Light Yellow Brass, 10c.; Heavy Clean Pipe Lead, 5 1/2c.; Junk Lead, 5c.; Tea Lead, Light Paper, 5 1/2c.; Tea Lead, Heavy Paper, 5c.; New Zinc Clippings, 4 1/2c. to 4 3/4c.; Old Sheet Zinc, 4c.; Yellow Brass Turnings, 8c. to 9c.; and Lead Brass Turnings, 10c. to 11c.; Plumbers' Lead Joints, 6c.

## PITTSBURGH.

Office of The Iron Age, 30 Fifth Avenue, PITTSBURGH, Jan. 9, 1877.

There has been no improvement in general business since the date of our last weekly report. Trade in manufacturing circles is reported unusually dull, even for this season of the year, when but little is expected, which may be attributed, to some extent, to the continued suspension of river navigation.

**Pig Iron.**—The demand continues very meager, confined entirely to supplying immediate actual wants, and while prices are weak,

there has been no change during the week under review. Rumors are current that an effort is to be made to "corner" our market; that some parties with ample means contemplate buying all the Pig Iron there is to be had, either here or at points tributary, and once they get control of the stock to run up prices. Whether there is any foundation for these rumors your correspondent is unable at present to state. Bituminous Coal and Coke Irons—No. 1 Foundry, \$24 to \$25, four months; No. 2 do., \$22 to \$23; Gray Forge, \$21 to \$22. Anthracite—No. 1 Foundry, \$24 to \$25, 4 mos.; Gray Forge, \$20. Hanging Rock Charcoal—No. 1 Foundry, \$27 to \$29, 4 mos.; No. 2 do., \$25; No. 3, at mill, \$23 to \$24.

**Manufactured Iron.**—There has been no improvement in the demand during the past week, and prices to manufacturers continue very unsatisfactory. Quite a number of the mills are still stopped, taking stock, and making repairs, and as things now look they will be in no hurry about starting up, as there is a general disinclination to piling up stock. It is hoped that business will brighten up within the next week or two, that orders will come forward more freely, and as prices have certainly touched hard pan, buyers need not be timid about stocking up. Merchant Bars are quoted at 1.90c. to 2c.; Sheet Iron No. 24, 3.30c.; Plate Iron, 2.90c.; Hoops, 1.80c. rates. These prices are at 60 days, with usual discount of two per cent. for cash.

**Nails.**—Trade continues dull, and nearly all the factories, both here and at Wheeling, are idle. Some of our manufacturers look for an increased demand within the next week or two, and while stocks in hands of jobbers are light, manufacturers and their agents are well supplied. No change whatever in prices; \$2.75, 60 days, for 200 keg lots and upward, with usual discount of 2 per cent. for cash. A regular meeting of the Western Association takes place here to-morrow.

**Steel.**—The demand, while it cannot be termed active, is about all that can be expected at this particular time, and our manufacturers generally are fairly supplied with orders. No recent change in prices, which are lower than they have been in the history of the trade in this country. Tool Steel quoted at 12c.

**Horse and Mule Shoes.**—Shoenberger & Co. continue to quote the former at 4 1/2c. and the latter at 5 1/2c. cash.

**Scrap.**—There is little or no movement in Scrap, and while stock in hands of dealers is comparatively light, it is fully up to present wants which are very meager. No. 1, Wrought, \$25; Car Wheels, \$20 to \$22.

**Glass.**—The Window Glass trade continues very dull, with only about one-half of the factories in operation. Prices unchanged; car load lots 50 per cent. off; smaller quantities, 45. Bottle trade also, very dull; green quoted at 75 to 75 and 10; and black, at 60 off. The Flint Glass trade is worse than it has been at any time since the panic; light demand and very unsatisfactory prices.

**Petroleum.**—No demand whatever for export, and it is rumored that some of the refineries here will shut down before long.

## BOSTON.

JAN. 6.—Pig continues to tend downward, with the supply steadily on the increase. No new blast furnaces are being blown in, but the receipts from those already in blast are more than sufficient for the demand. We quote: No. 1, \$21.50 to \$22; and Gray Forge, \$18.50 to \$19. Scotch pig is dull, partly on account of the decline in gold. Bar is very quiet, and may be quoted at \$47 to \$48 for Refused and \$38 to \$39 for Common. Copper is quoted at 19 1/2c. to 19 3/4c. for large lots of Lake Ingot, and 19 1/2c. to 20 1/2c. for small lots. The market is a trifle steadier, based partially on the more warlike news from Europe, but is not very strong. For Manufactured we quote: New Sheathing, 31c.; Bolts and Braziers, 32c.; Yellow Metal Bolts, 32c.; do. Sheathing, 21c. Lead is rather weak in tone, but prices are no lower. We quote: Pig, 6 1/2c. to 6 3/4c., currency, for Domestic; Sheet, 9 1/2c.; Pipe, 9c.; Tin Lined Pipe, 16 1/2c.; Bar Lead, 5 1/2c., less usual trade or 10 per cent. discount. Antimony is quiet at 13 1/2c. to 14c., gold, for Boston spot lots, and Spelter continues weak at \$7.75 on the spot for 10 ton lots. Tin continues rather easy, with a limited demand and increasing supplies. We quote: Straits, 17 1/2c. to 17 3/4c.; Banca, 19 1/2c. to 20 1/2c.; Refined English, 17 1/2c. to 17 3/4c., gold. We quote Plates: Charcoal I. C., \$7 to \$7.50; Coke, \$6.25 to \$6.50; and Terne at \$7 to \$7.50, gold.—Commercial Bulletin.

## ST. LOUIS.

Messrs. SPOONER & COLLINS, iron commission agents, 409 North Third street, St. Louis, under date of Jan. 4, report the iron market as follows: Our market remains about the same as last quoted. We look for a change for the better in the course of a few weeks. Prices are firm at quotations.

CHARGEABLE.	
Missouri No. 1 Foundry	\$23.00 @ 25.00—4 mos.
" No. 2 Foundry	22.00 @ 23.00—4 mos.
" Gray Mill	21.00 @ 22.00—4 mos.
Hanging Rock No. 1 Foundry	23.00 @ 25.00—4 mos.
" No. 2 Foundry	22.00 @ 23.00—4 mos.
" Gray Mill	21.00 @ 22.00—4 mos.
Tennessee No. 1 Foundry	23.00 @ 25.00—4 mos.
" No. 2 Foundry	22.00 @ 23.00—4 mos.
" Gray Mill	21.00 @ 22.00—4 mos.
COKE.	
Alice H. R. Ex. No. 1 Foundry	\$36.00 @ —4 mos.
" No. 1 Foundry	25.00 @ —4 mos.
" B No. 1 Foundry	24.00 @ —4 mos.
" No. 2 Foundry	23.00 @ —4 mos.
" Forge	22.00 @ —4 mos.
CHATTANOOGA, TENN., No. 1	
Foundry	25.00 @ —4 mos.
Chattanooga, Tenn., No. 2	23.00 @ —4 mos.
Chattanooga, Tenn., Forge	22.00 @ —4 mos.
and Mottled	21.00 @ —4 mos.
STONE COAL.	
Missouri No. 1 Foundry	\$25.00 @ 26.00—4 mos.
" No. 2 Foundry	24.00 @ 25.00—4 mos.
" Gray Mill	23.00 @ 24.00—4 mos.
" White and Mottled	21.00 @ 22.00—4 mos.
COLD BLAST CHARCOAL—All Numbers.	
Hanging Rock	\$25.00 @ 46.00—4 mos.
Tennessee	30.00 @ 35.00—4 mos.
Kentucky	30.00 @ 33.00—4 mos.
Missouri	28.00 @ 30.00—4 mos.
Georgia	28.00 @ 30.00—4 mos.
Alabama	28.00 @ 30.00—4 mos.
Assorted Bar Iron	@ 2 1/2 rates.
No. 1 Wrought Scrap	95 @
Heavy Cast	70 @
Light Cast	60 @

## CINCINNATI.

Messrs. L. R. HULL & Co., under date of Jan. 6, write us as follows: Pig Iron.—River navigation is still suspended, cutting off communication entirely with a considerable number of furnaces tributary to Cincinnati. There has been some improvement in the amount of sales during the past week, and the market is firm at current rates, while no advance has taken place. While there is, it must be admitted, much room for improvement, yet in the status of trade it seems there is every reason to be hopeful that a better state of things will soon be reached. Indeed, from information carefully compiled of the actual condition of the market, we cannot see how prices can much longer be kept down to their present level. It is true the market has frequently, during the present long depression, from which we appear to be now emerging, been temporarily very firm, leading to hopeful predictions which were not then to be realized, but the conditions were entirely different than from now. Stocks have been immensely reduced, and the Charcoal furnaces, nearly all of which are now idle, cannot start again for some months, leaving this space to be bridged over. The Coke and Stonecoal furnaces now out of blast (amounting to a considerable percentage) will not resume unless an advance can be realized and sustained. Some months since any advance must have been produced, if at all, by a combination of the furnaces to force up prices, while now it seems quite likely it may be realized before long by a competition among buyers to secure first-class iron, of which the supply is constantly decreasing, and is at this writing very light.

## HOT-BLAST FOUNDRY.

Hanging Rock No. 1, Charcoal	23.00 @ 24.00—4 mos.
Hanging Rock No. 2, Charcoal	22.00 @ 23.00—4 mos.
" No. 1, Coke	24.00 @ 25.00—4 mos.
" No. 2, "	23.00 @ 24.00—4 mos.
" No. 1, Stone	22.00 @ 23.00—4 mos.
" No. 2, "	21.00 @ 22.00—4 mos.
Ala. and Tenn., No. 1, Charcoal	23.00 @ 24.00—4 mos.
Red Short, No. 1, Coke	22.00 @ 23.00—4 mos.
Fannie U. S. Scotch, No. 1	24.00 @ —4 mos.
Alice	25.00 @ —4 mos.
Am. Scotch, No. 1	22.00 @ —4 mos.

## FORGE IRONS.

Hanging Rock No. 1, Charcoal	23.00 @ 24.00—4 mos.
Hanging Rock No. 2, Charcoal	22.00 @ 23.00—4 mos.
Virginia, No. 1, Coke	24.00 @ 25.00—4 mos.
Ala. and Tenn., No. 1, Charcoal	23.00 @ 24.00—4 mos.
Red Short, No. 1, Coke	22.00 @ 23.00—4 mos.
Cold Short, No. 1, Stonecoal	19.00 @ 20.00—4 mos.
CAR WHEEL AND MALLEABLE.	
Hanging Rock	\$20.00 @ 21.00—4 mos.
Southern and Western Brands	35.00 @ 40.00—4 mos.

## LOUISVILLE.

Messrs. GEO. H. HULL & Co., under date of Jan. 8, write us as follows: The market continues without change either in prices or tone. The stocks of all grades of Hot-blast iron in this market, or furnaces tributary thereto, are small, and any considerable demand during the next four months must necessarily stiffen prices. The stocks of Car Wheel iron are ample to meet all prospective demands. The usual time, four months, allowed on quotations below:



Temperature for working.



## The Coal Market.

Anthracite.		PRICES FOR JANUARY.	
Lump	Steamer	Broken	Stove
PENNSYLVANIA COAL CO., at New York, 40 cents per ton additional. Deliverable at Weehawken.			
Pittston	3.00	3.00	3.10
Lackawanna	3.00	3.00	3.10
DELAWARE AND HUDSON CANAL CO., at Weehawken, N. J.			
Lackawanna	3.00	3.00	3.10
LEHIGH AND WILKES-BARRE COAL CO., f.o.b. at Port Johnson, N. J.			
Old Company's Summit	3.75	3.25	3.75
Honey-Brook Lehigh	3.75	3.25	3.75
Wilkes-Barre	3.00	3.00	3.75
Plymouth Red Ash	3.00	3.00	3.75
DELAWARE, LACKAWANNA AND WESTERN, at Hoboken, N. J.—Auction, Nov. 22.			
Scranton	2.75	2.70	3.50
FREDERICK A. POTTS, 110 Broadway, New York.—Port Johnson, Elizabethport and Hoboken.			
L. & W. C. Co.'s Wilkes-Barre	3.00	3.00	3.75
L. & W. C. Co.'s Old Co. Lehigh	3.75	3.25	3.75
L. & W. C. Co.'s Plymouth Red Ash	3.00	3.00	3.75
L. & W. C. Co.'s Honey-Brook Lehigh	3.75	3.25	3.75
Scranton	3.00	3.00	3.75

WHITNEY, McCREARY & KEMMERER, 111 Broadway, New York.—John White, Sales Agent.—F.o.b. at Elizabethport or South Amboy.			
Upper Lehigh and Conyngham Ridge	3.75	3.25	3.75
Everhardt Wyoming	3.75	3.25	3.75
Wilkes-Barre	3.00	3.00	3.75
Shamokin	3.75	3.25	3.75
East Spring Mountain Lehigh	3.75	3.25	3.75

A. S. SWORDS, 111 Broadway.—Coal at Newburgh.			
Pittston Coal	3.00	3.00	3.10

G. B. LINDERMAN & CO., No. 111 Broadway.			
Sugar Loaf, (Lehigh)	3.75	3.25	3.75

MEERER & DEAN, 111 Broadway.			
Lackawanna Valley	3.00	3.00	3.75
Kingsport, Wm's White Ash	3.00	3.00	3.75
Chamney Wyoming Red Ash	3.75	3.25	3.75
Wilkes-Barre	3.00	3.00	3.75
Beaver Brook Lehigh	3.75	3.25	3.75
Cross Creek Lehigh, at Elizabethport, N. J.	3.75	3.25	3.75

LEHIGH VALLEY COAL CO., corner Courtland and Church sts.—F.o.b. at Perth Amboy.			
Spring Mountain Lehigh	3.75	3.25	3.75
Spring Brook Lehigh	3.75	3.25	3.75
Jeddo Lehigh	3.75	3.25	3.75
Highland Lehigh	3.75	3.25	3.75
Wyoming White and Red Ash	3.50	3.25	3.75
Franklin (Wilkes-Barre)	3.50	3.25	3.75
Centerville	3.50	3.25	3.75
A. PARDEE & CO., 111 Broadway, Room 31.—F.o.b. at Perth Amboy and Hoboken.			
Hazleton, Sugar Loaf, Lattimer, and Hollywood Lehigh Coals	3.75	3.25	3.75
Mount Pleasant, f.o.b. at Hoboken	3.75	3.25	3.75

Bituminous.			
Cumberland, at Georgetown	2.50	2.50	2.50
West Virginia, at Baltimore	4.50	4.50	4.50
Kittanning f.o.b. Baltimore	4.25	4.25	4.25
Newburg Orzel, at Despard, at Baltimore	4.50	4.50	4.50
Broad Top, at South Amboy	4.75	4.75	4.75
Morristown, Wiggins	4.75	4.75	4.75
Cunard	4.75	4.75	4.75
" at Philadelphia	4.75	4.75	4.75
Consolidation Coal Co. f.o.b. Georgetown	3.50	3.50	3.50
Consolidation Coal Co. f.o.b. Baltimore	3.50	3.50	3.50
In barges at New York	3.50	3.50	3.50
Maryland Coal Co. f.o.b. Baltimore	4.00	4.00	4.00
Maryland Coal Co. f.o.b. Georgetown	3.75	3.75	3.75

## London Metal Market.

(From The Mining Journal.)							
Iron.							
Pig, Scotch, f. o. b. Clyde.....	3	15	0	0	0	0	0
" "							

\* At the works, 18, to 18.6d. per box less for ordinary 10s. per ton less for Canada; 1X 5s. per box more than 10s. per ton, and 10s. 6d. for each X. Terms plates 2s. per box below tin plates of similar brands.

## The Iron Age,

A REVIEW OF THE

Hardware, Iron and Metal Trades,

Published every Thursday by DAVID WILLIAMS at

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20 Fifth Avenue, Pittsburgh,  
220 S. Fourth St., Philadelphia.

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THE IRON AGE is the oldest newspaper in the world devoted to the Iron, Hardware and Metal Trades, having been established in 1855 under the name of *The Hardwareman's Newspaper*, which was changed in 1859 to *The Iron Age*. The next oldest journal of its class is *The Ironmonger*, of London, established in 1859.

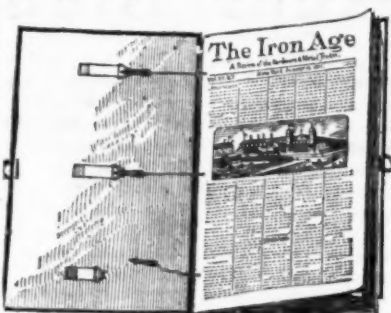
*The Iron Age* is by far the largest newspaper in the world, each issue, whether Weekly, Semi-Monthly or Monthly, consisting of thirty-six to forty large, five-column pages, containing about fifty columns of carefully prepared reading matter, all of which is of particular interest to the Iron, Hardware and Metal Trade, beside about fourteen columns of Iron, Hardware and Metal Quotations, corrected carefully every week.

*The Iron Age* is the only newspaper that has ever succeeded in satisfactorily reporting the Hardware market, either in America or Europe. It has had numerous imitators, but no successful rival.

Its weekly table of New York Wholesale Hardware Prices has been greatly extended and improved during the past two years, until it now gives the quotations of nearly all articles dealt in by the trade; and its prices are everywhere considered as authority.

Its Iron and Metal Reports are full, complete, and as accurate as it is possible to make them. In this department all the important Markets in this country are represented. The English Iron Market is reported weekly by Cable, beside which we present Condensed Reports from nearly all the Metal Yielding Countries of the World.

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Pardee, Bro. &amp; Co. LATTIMER.

C. Pardee &amp; Co. HOLLYWOOD.

Pardee &amp; Sons MT. PLEASANT.

OFFICE IN NEW YORK:

WM. MERSHON, Agent,  
No. 111 Broadway.

## Lehigh Valley Coal Co.,

MINERS AND SHIPPERS OF  
Lehigh, Wyoming White & Red Ash,  
(BALTIMORE VEIN.)

Office, cor. Courtland & Church Sts.  
Coal and Iron Exchange Building.  
GEORGE B. NEWTON, Agent. Shipments by Rail Road and Morris Canal direct from the mines, and from Perth Amboy and Jersey City, for all Points.

THE HOBOKEN COAL CO.,  
Dealers in

SCRANTON, LEHIGH and other COALS.

Retail Yard on D. L. & W. Railroad, cor. Grove and 19th Sts., Jersey City. Coal delivered direct from Shutes to Carts and Wagons. Families and manufacturers supplied with the best qualities of Coal at the lowest rates.

Offices: At Yard cor. Grove and 19th Sts.; cor. Bay St. and Newark Ave., Jersey City; Room 31, 111 Broadway, N. Y. General Office, Bank Building, cor. Newark and Hudson Sts., Hoboken. P. O. Box 247, Hoboken.

GRANT & CO., Newark, N. J.  
Cap Rifles & Targets.

## National Horse Nail Co.

MANUFACTURERS OF

## FINISHED

[BRIGHT OR BLUED]



These nails are made of the best brands of NORWAY IRON, and are guaranteed to be equal to any in the market.

NATIONAL HORSE NAIL CO.,  
VERGENNES, VT.Worcester Machine Screw Co.,  
Worcester, Mass. Established 1867.Manufacturers of  
STANDARD MACHINE SCREWS,  
ALSOSquare, Round, and Hexagon Head  
Set and Cap  
SCREWS.

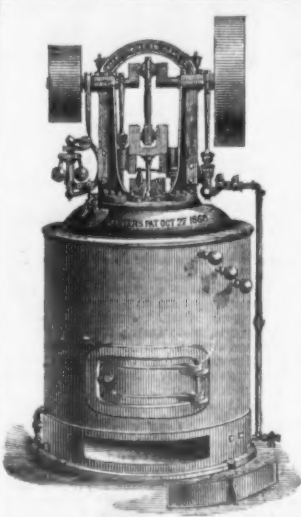
In Iron, Steel and Brass.

Attention is called to our Reduced Lists, adopted January 1, 1877.

Price List of Iron Machine Screws—Per Gross.

Threads per Inch.		Threads per Inch.		Threads per Inch.	
32	30 & 24	24	20	16 & 12	16
No. 6	8	10	12	14	16
Inch	Cts.	Cts.	Cts.	Cts.	Cts.
1/2	21	36	31	27	48
3/4	21	36	31	27	48
1	29	33	27	24	48
1 1/4	30	34	28	24	48
1 1/2	30	34	28	24	48
1 3/4	37	43	33	24	48
2	37	43	33	24	48
2 1/4	40	46	36	24	48
2 1/2	40	46	36	24	48
2 3/4	40	46	36	24	48
3	40	46	36	24	48
3 1/4	40	46	36	24	48
3 1/2	40	46	36	24	48
3 3/4	40	46	36	24	48
4	40	46	36	24	48

Prices for sizes or threads not on above list furnished on application. A full line of all goods kept in stock at both the factory and store of our agents.

H. S. MANNING & CO.,  
No. 111 Liberty St., New York.  
Send for Lists and Discounts.THE  
Baxter Portable Steam Engine

MANUFACTURED BY

Colt's Patent Fire Arms Mfg. Co.,  
OF HARTFORD, CT.

Awarded First Premium by the American Institute successively from 1869 to 1876.  
And the Highest Award at the Centennial Exhibition, Philadelphia, 1876.

For sale by  
THOMAS J. FALES, General Agent,  
Office, 18 Park Place, N. Y. P. O. Address, Box 3971.



**WILSON BOHANNAN**

Manufacturer of Patent

**BRASS  
Pad Locks,**

FOR

**Railroad Switches,  
Freight Cars,****AND THE HARDWARE TRADE.**

All sizes, with Brass and Steel

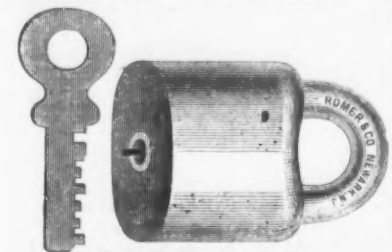
Keys, with and without chains.

**PASSENGER CAR LOCKS,**

Bronzed, Nickel-Plated and Japanned.

**BROOKLYN, N. Y.**

Illustrated Catalogues sent upon application.

**ROMER & CO.,**

Established 1837. Manufacturers of Patent Scandinavian or Jail Locks. Brass Pad Locks for Railroads and Switches. Also, Patent Stationary R. R. Car Door Locks. Patent Piano and Sewing Machine Locks. 141 to 145 Railroad Avenue, NEWARK, N. J. Illustrated Catalogue sent upon application.

**FISHER'S PATENT  
Moving Machine Knife  
GRINDER.**PRICE,  
\$3.00.Send for  
Circular.

ADDRESS

Canton,  
Ohio.**HENRY FISHER,****LEIGHTON BRIDGE AND IRON WORKS,****Rochester, N. Y.****Wrought Iron Riveted  
Lattice Railroad**

AND

**HIGHWAY BRIDGES.****Wrought Iron****WATER PIPE.**The most economical and durable Pipe man-  
ufactured for Water Works, Oil Lines or Gas Mains.**General Riveted Work**Orders Solicited from Civil Engineers  
and Contractors.[Accompanying engraving represents the Spring-  
field Bridge, built by the Leighton  
Bridge and Iron Works.]**SPRING PERCH CO., Bridgeport, Conn.**

Established 1843. Manufacturers of FIRST QUALITY

**SPRINGS & AXLES**

And Beer's Patent Curtain Rollers, Concealed Hinges, Etc., Springs of any pattern made to order. Send for Circular and Price List.

**L. COES' GENUINE IMPROVED PATENT  
SCREW WRENCHES.**

Manufactured by

**L. COES & CO.,  
Worcester, Mass.**We invite the particular attention of the  
trade to our New Straight Bar Wrench, *widened*,  
full size of the larger part of the so called  
"reinforced or jog bar." Also our enlarged jaw,  
made with ribs on the inside, having a full  
bearing on the front of bar (see sectional view),  
making the jaw fully equal to any strain the  
bar may be subjected to.These recent improvements in combination  
with the nut inside the ferule firmly screwed  
up flush, against square, solid bearings (that  
cannot be forced out of place by use), verifies  
our claim that we are manufacturing the  
strongest Wrench in the market.We would also call attention to the fact,  
that in 1869 we made several important im-  
provements (secured by patents), on the old  
wrench previously manufactured by L. & A.  
G. Coes which were at once closely imitated  
and sold as the *Genuine Wrench* by certain par-  
ties who seem to rely upon our improvements  
to keep up their reputation as manufacturers,  
and although the fact of their imitating our  
goods may be good evidence that we manufac-  
ture a superior Wrench, we wish the trade may  
not be deceived on the question of originality.  
Trusting the trade will fully appreciate our  
recent efforts, both in improvements on the  
Wrench and in the adoption of a Trade Mark,  
we would caution them against imitations.  
None genuine unless stamped**"L. COES & CO."**Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.  
**HORACE DURRIE & CO., Sole Agents.****HERMAN BEHR & COMPANY**Manufacturers and  
Importers of**GLUE**261 Pearl Street,  
New York City.We wish to inform Hardware Dealers through-  
out the country that we are putting up for the  
Christmas trade, in neat paper boxes, the following  
articles:**One Highly Polished Spring Steel  
Bracket Saw Frame,** with patent indestructi-  
ble Clamps.**Six Saw Blades.****Fifty Designs,** embracing a great variety of  
fancy and useful articles.**One Sheet of Impression paper,** and  
**One Brad Awl.**With full directions for using the Saw.  
List price, per Box, \$1.25.We have advertised these goods thoroughly  
throughout the country, and notified all interested  
persons that they could buy of the dealers at our  
regular rates. The demand for these tools is rap-  
idly increasing, and some of them are in use in  
almost every town. They will sell in every hard-  
ware store where shown.**Millers Falls Company**74 Chambers Street, NEW YORK,  
Corner of Broadway.**Silver's Patent Meat Stuffers.****Nos. 1 and 2. Single Geared.**Capacity of No. 1, 6 lbs. Weight of No. 1, boxed, 30 lbs. Price, \$6.00.  
Capacity of No. 2, 9 lbs. Weight of No. 2, boxed, 40 lbs. Price, 9.00.**Nos. 3 and 4. Double Geared.**Capacity of No. 3, 12 lbs. Weight of No. 3, boxed, 60 lbs. Price, \$18.00.  
Capacity of No. 4, 20 lbs. Weight of No. 4, boxed, 75 lbs. Price, \$25.00.**FAMILY SIZES.****BUTCHERS' SIZES.****THE BEST IN USE. SEND FOR CIRCULAR.****BAILEY WRINGING MACHINE CO., 99 Chambers St., N. Y.****HOWARD PARALLEL BENCH VISE.**

MANUFACTURED BY

**Howard Iron Works,**Send for price list. **Buffalo, N. Y.**  
RUSSELL & ERWIN MFG. CO. NEW YORK & PHILADELPHIA AGENTS.**JOSEPH THOMPSON,  
Block & Pump Maker,**36 Burling Slip and 86 South St.,  
Near Pier 20, East River, NEW YORK.**STEERING APPARATUS,**

For Steamships, &amp;c., made and fitted up.

**Iron Pumps Reamed & Re-Chambered.**Also, Patent Pressed Pump Leathers, Galvanized  
Iron Hanks, Cans, Mast Hooks, Hanks, Belaying  
Pins, Hand Spikes, Capstan-bars, Hand Pumps, &c.,  
and every article appertaining to the trade, of the  
best material. General dealer in Lignumvite.**PHILIP S. BIGLIN,**

Successor to W. F. SHATTUCK &amp; CO.,

Manufacturers' Agent for

**AMERICAN HARDWARE.**

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Shattuck's Union and Counter Scales,  
Phelan's Axes, Hatchets, Picks, &c.,  
Wellman's Gimlets, Gimlet Bits, &c.,  
Griswold's Augers, Auger Bits, &c.,  
Hobbs & Co.'s Stocks and Dies,  
Taw's "Genuine" Wrought Cow Bells,  
Barton's Hand and Sleigh Bells.Maltby's Britannia and Cocoa Dippers,  
Eddy's Steamed Lamp Black,  
"Eagle" Axe, Pick and other Handles,  
"Eureka" Flint, Sand and Emery Papers,  
Cartland Patented Horse Nails,  
Tackie Blocks, Spikes, &c., &c.

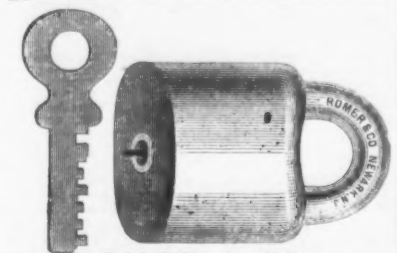






## WILSON BOHANNAN

Manufacturer of Patent  
**BRASS**  
**Pad Locks,**  
FOR  
**Railroad Switches,**  
**Freight Cars,**  
AND THE HARDWARE TRADE.  
All sizes, with Brass and Steel  
Keys, with and without chains.  
**PASSENGER CAR LOCKS,**  
Bronzed, Nickel-Plated and Japanned.  
**BROOKLYN, N. Y.**  
Catalogues and Samples sent upon application.



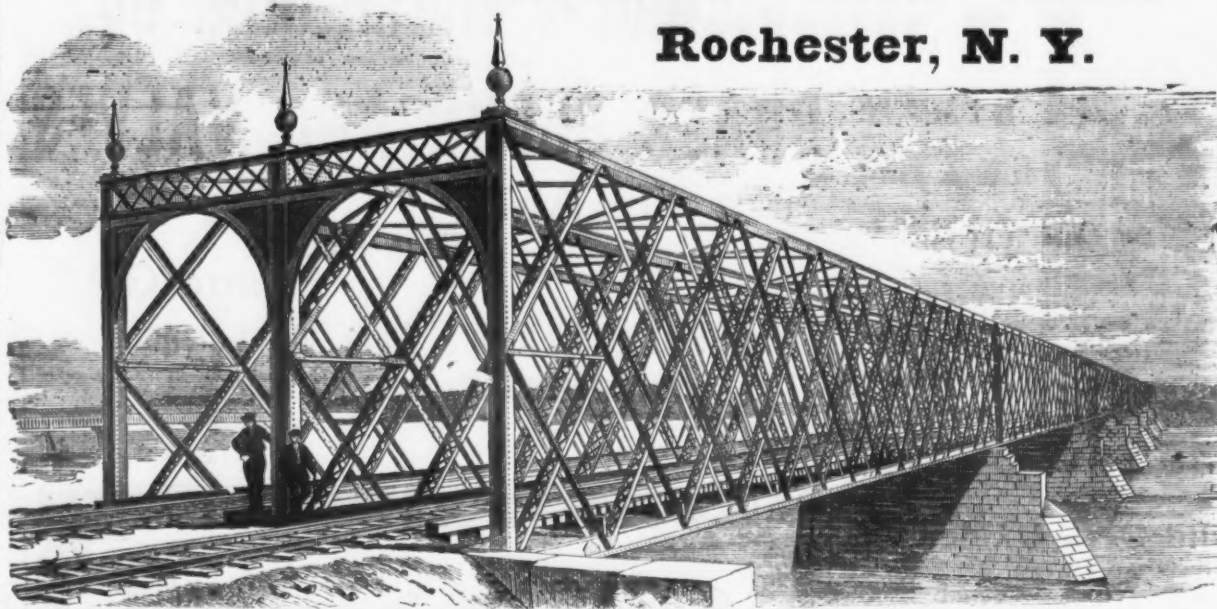
**ROMER & CO.,**  
Established 1837. Manufacturers of Patent Scandinavian  
or Jail Locks. Brass Pad Locks for Railroads and  
Switches. Also, Patent Stationary R. R. Car Door  
Locks. Patent Piano and Sewing Machine Locks.  
141 to 143 Railroad Avenue, N. E. W. A. S. N. J.  
Illustrated Catalogue sent on application.

**FISHER'S PATENT**  
**Mowing Machine Knife**  
**GRINDER.**  
or hand for  
Circular.  
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**HENRY FISHER,**

PRICE,  
\$3.00.

# LEIGHTON BRIDGE AND IRON WORKS,

Rochester, N. Y.



Wrought Iron Riveted  
Lattice Railroad

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**HIGHWAY BRIDGES.**

Wrought Iron

**WATER PIPE.**

The most economical and durable Pipe manu-  
factured for Water Works, Oil Lines or Gas Mains.

**General Riveted Work**

Orders Solicited from Civil Engineers  
and Contractors.

[Accompanying engraving represents the Spring-  
field Bridge, built by the Leighton  
Bridge and Iron Works.]

**SPRING PERCH CO., Bridgeport, Conn.**

Established 1843. Manufacturers of FIRST QUALITY

# SPRINGS & AXLES

And Beer's Patent Curtain Rollers, Concealed Hinges, Etc., Springs of any pattern made to order. Send for Circular and Price List.

## L. COES' SCREW WRENCHES.

Genuine Improved Patent

Manufactured by

**L. COES & CO.,**  
Worcester, Mass.



We invite the particular attention of the  
trade to our New Straight Bar Wrench, widened,  
full size of the larger part of the so called  
"reinforced or jog bar." Also our enlarged jaw,  
made with ribs on the inside, having a full  
bearing on the front of bar (see sectional view),  
making the jaw fully equal to any strain the  
bar may be subjected to.

These recent improvements in combination  
with the nut inside the ferrule firmly screwed  
up flush, against square, solid bearings (that  
cannot be forced out of place by use), verifies  
our claim that we are manufacturing the  
strongest Wrench in the market.

We would also call attention to the fact,  
that in 1869 we made several important im-  
provements (secured by patents), on the old  
wrench previously manufactured by L. & A.  
G. Coes which were at once closely imitated  
and sold as the Genuine Wrench by certain par-  
ties who seem to rely upon our improvements  
to keep up their reputation as manufacturers,  
and although the fact of their imitating our  
goods may be good evidence that we manufac-  
ture a superior Wrench, we wish the trade may  
not be deceived on the question of originality.  
Trusting the trade will fully appreciate our  
recent efforts, both in improvements on the  
Wrench and in the adoption of a Trade Mark,  
we would caution them against imitations.  
None genuine unless stamped

"L. COES & CO."

Warehouse, 97 Chambers St., & 81 Reade Sts., N. Y.  
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**HERMAN BEHR & COMPANY**

Manufacturers and  
Importers of

**GLUE**

261 Pearl Street,  
New York City,



We wish to inform Hardware Dealers through-  
out the country that we are putting up for the  
Christmas trade, in neat paper boxes, the following  
articles:

**One Highly Polished Spring Steel**  
**Bracket Saw Frame,** with patent indestructi-  
ble Clamps.

**Six Saw Blades.**

**Fifty Designs,** embracing a great variety of  
fancy and useful articles.

**One Sheet of Impression paper,** and  
**One Brad Awl.**

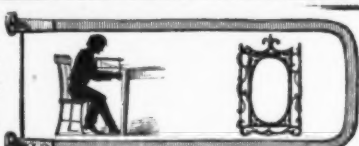
With full directions for using the Saw.

List price, per Box, \$1.25.

We have advertised these goods thoroughly  
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persons that they could buy of the dealers at our  
regular rates. The demand for these tools is rap-  
idly increasing, and some of them are in use in  
almost every town. They will sell in every hard-  
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**Millers Falls Company**

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## Silver's Patent Meat Stuffers.



Nos. 1 and 2. Single Geared.

Capacity of No. 1, 6 lbs. Weight of No. 1, boxed, 30 lbs. Price, \$6.00.  
Capacity of No. 2, 9 lbs. Weight of No. 2, boxed, 40 lbs. Price, 9.00.



Nos. 3 and 4. Double Geared.

Capacity of No. 3, 12 lbs. Weight of No. 3, boxed, 60 lbs. Price, \$18.00.  
Capacity of No. 4, 20 lbs. Weight of No. 4, boxed, 75 lbs. Price, \$25.00.

**FAMILY SIZES.**

**BUTCHERS' SIZES.**

THE BEST IN USE. SEND FOR CIRCULAR.

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**JOSEPH THOMPSON,**  
**Block & Pump Maker,**

36 Barling Slip and 86 South St.,  
Near Pier 20, East River, NEW YORK.

**STEERING APPARATUS,**

For Steamships, &c., made and fitted up.

**Iron Pumps Reamed & Re-Chambered.**

Also, Patent Pressed Pump Leathers, Galvanized  
Iron Hanks, Oars, Mast Hooks, Hanks, Belaying  
Pins, Hand Spikes, Capstan-bars, Hand Pumps, &c.,  
and every article appertaining to the trade, of the  
best material. General dealer in Lignumvite.

**PHILIP S. BIGLIN.**

Successor to W. F. SHATTUCK & CO.,

Manufacturers' Agent for

**AMERICAN HARDWARE.**

95 Reade & 113 Chambers Sts., New York,

Shattuck's Union and Counter Scales.  
Phelan's Axes, Hatchets, Picks, &c.  
Wellman's Gimlet, Glimet Bits, &c.  
Griewald's Augers, Auger Bits, &c.  
Holroyd & Co.'s Stocks and Dies.  
Yaw's "Genuine" Wrought Cow Bells.  
Baron's Hand and Bleigh Hells.

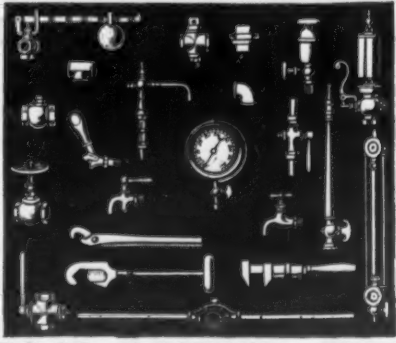
Mally's Britannia and Cocon Dippers.  
Eddy's Redwood Lamp Black.  
"Eagle" Axe, Pick and other Handles.  
"Kurek's" Flint, Sand and Emery Papers.  
Cortland Forged Horse Nails.  
Tackle Blocks, Spokes, &c., &c.



# EATON, COLE & BURNHAM CO.,

58 John Street, New York.  
MANUFACTURERS OF

Wrought Iron  
PIPE,  
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LARGED PIPE,  
Cast Iron  
RADIATORS  
and BOILERS.



Brass & Iron  
STEAM  
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FITTINGS.  
PLUMBERS'  
MATERIALS.

STEAM GAUGES, TOOLS,  
and all Supplies used by Machinists, &c.

## Pyrolusite Manganese Co.,

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Crystallized Black and Gray Oxides of  
**MANGANESE.**

Ground, granulated and especially prepared to suit all branches of the home trade.  
Warranted to contain from 70 to 90 per cent. peroxide of manganese, and to give satisfaction with regard to price and quality.

ALSO, MANUFACTURERS OF SUPERFINE FLOATED

**Standard Barytes.**

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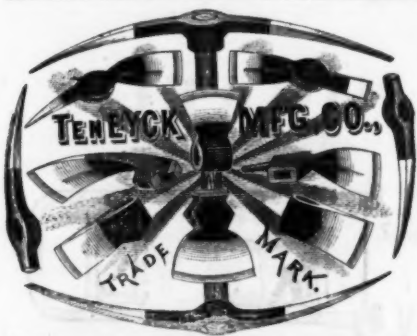
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HAVE FOR SALE THE FOLLOWING

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One 6 H. P. Agricultural Engine, \$535; one 5 H. P. Portable Engine, \$350; one 8 1/2 x 16 Horizontal Engine, Pump and Heater, \$575; one No. 1 Sturtevant Exhaust Fan, \$35; one 4 x 6 Vertical Engine, \$175; one 3 x 4 Horizontal Engine, nickel-plated, very handsome, \$75; one 2 x 4 Horizontal Engine, \$35; one 2 x 6 Beam Engine, \$75; one 2 1/2 x 5 1/2 Horizontal Engine, \$80. Portable Forges, all sizes; the Selden Steam Pumps; Clark's Blower; Belt Pumps; Governors, Injectors, Oil and Fuel Cans, Oil Cases, Vases, Belting, Packing, Hose, &c. Also the following second-hand Machinery: one 50 H. P. Horizontal Tubular Boiler, nearly new, \$750; one 20 H. P. Vertical Tubular Boiler, \$350; one 8 H. P. Vertical Tubular Boiler, \$275—this is very good; three Horizontal Engines, 8 1/2 x 16, \$175; 7 x 10, \$170; 6 x 12, \$170; One Platform Scale, 4000 pounds capacity, \$90; one Large Alden Fan, outlet 14 x 22, \$80; one Grindstone, with Iron Stand, very good, \$20; one No. 2 Worthington Pump, \$90. Lot Wrought Iron Pipe, Gate Bars, &c. Also one 7 1/2 x 10, Washington Iron Works, Portable Engine on skids, very good order, \$475.



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**AXES**

Of all kinds.

Hatchets, Adzes, Grub Hoes, Mattocks and Picks.

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**John T. Lewis & Bros.**

No. 231 South Front St.,  
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TRADE MARK.

MANUFACTURERS OF  
**PURE WHITE LEAD, RED LEAD,  
Litharge, Orange Mineral,  
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AND PAINTERS' COLORS.**



**The Atlantic White Lead and Linseed Oil Company,**

MANUFACTURERS OF  
**White Lead (Atlantic), Red Lead,  
Litharge & Linseed Oil.  
ROBERT COLGATE & CO.,  
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**WETHERILL & BROTHER,**  
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RED LEAD, LITHARGE & ORANGE MINERAL.**  
OFFICES, 31st STREET, Below CHESTNUT, PHILADELPHIA.

**Brooklyn White Lead Co.**



TRADE MARK.

**White Lead, Red Lead and  
Litharge.**  
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FISKE & HOWE, Treas.

**JOHN JEWETT & SONS,**

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TRADE MARK.

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MANUFACTURERS OF

## BRASS COCKS AND VALVES

For STEAM, WATER and GAS.

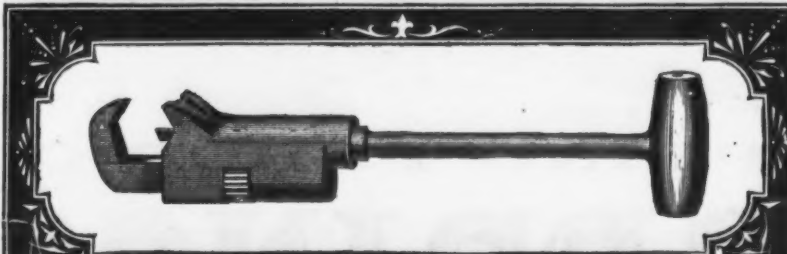
Iron Pipe and Fittings, Plain and Galvanized.

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Factory, Paterson, N. J.

56 John Street N. Y.



## The Acme Pipe Cutter.

MADE ENTIRELY OF SOLID CAST STEEL.

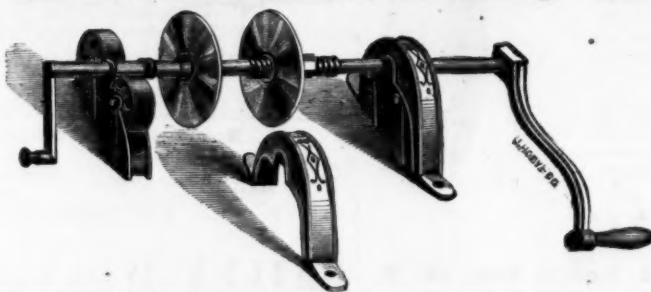
Cuts Wrought Iron, Brass and Copper Pipes, Round Iron &c perfectly true without leaving burr on pipe contracting or splitting it. Cuts out a chip similar to a lathe tool. The knife may be removed and ground. Send for descriptive circular to manufacturers.

**Pancoast and Maule**  
PHILADELPHIA PA.



## READING BUTT WORKS.

RICK BROTHERS, Reading, Pa.,



MANUFACTURERS OF DRILLED, CAST BUTTS, AXLE PULLEYS, BRONZED and JAPANNED BRACKETS, GRIND STONE HANGINGS, HAY FORK PULLEYS, HAT and COAT, HARNESS and SCHOOL HOUSE HOOKS, DOOR LATCHES, B. D. HANGERS and RAIL, APPLE PARERS, WALL SAFES OR CYLINDER RINGS, and BUILDERS' and SHELF HARDWARE GENERALLY.  
Particular attention paid to goods for export.

New York Warerooms, 103 Chambers Street. E. E. YATES & CO., Agents.

**IRON BLOCK PLANE.**

1-2 Inches Long, 1 3-4 Inch Cutter, \$9.00 per dozen.



STANLEY RULE AND LEVEL COMPANY, Manufacturers of  
Factories, New Britain, Conn. Warerooms, 35 Chambers St., N. Y.

The Famous Improved

## SHEPARDSON LOCKS

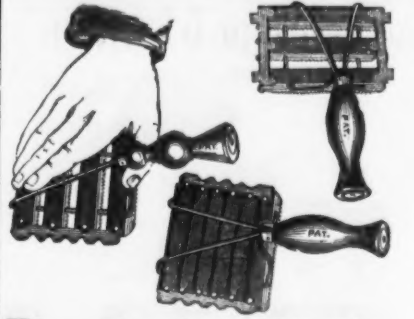
Are the "Best" in the World.

**The United States Lock Co.,**

Office and Manufactory, KINGSTON, MASS.

**WM. F. DONOVAN, General Manager.**

NEW YORK OFFICE, 97 Chambers Street,



## The Perfect Comb.

We call your attention specially to our new patent end-less wire frame comb. The result of a long series of experiments, made with a view to meeting all the requirements of a Perfect Comb, it is better, stronger, and more durable than any ever before invented. The raised wire shank gives what has never before been attained, viz: a rest and brace for the thumb, in such a position that the hand cannot come in contact with the horse while using the comb. The wire braces which run from the shank over the back to the front teeth give strength and durability in a direction never heretofore attained, and at the same time serve as an extra handle; and when clasped by the fingers in connection with the raised shank the comb is more firmly, easily, and completely held, and with much less fatigue to the hand than is possible in any other formation—in short, it needs but a trial to vindicate its name: **The Perfect Comb.**

**THE LAWRENCE COMB CO.**

Factory and Office,

382 2d Ave., cor. 22d St., N. Y.

**WM. S. CARR & CO.**

Sole Manufacturers of



**CARR'S**

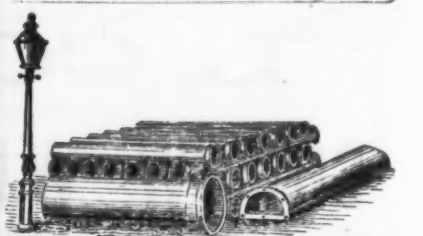
PATENT

Water

Closets,

PUMPS, CABINET WOOD WORK, &c.

106, 108 & 110 Centre Street,  
Factory, Mott Haven, NEW YORK.



## R. D. WOOD & CO.,

Philadelphia,

Manufacturers of

## Cast Iron Pipe

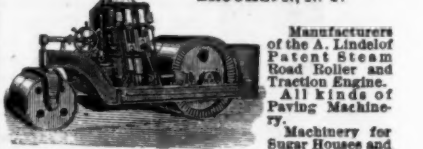
FOR WATER AND GAS.

Lamp Posts, Valves, &c.,  
Mathew's Pat. Anti-Freezing Hydrants.  
400 CHESTNUT STREET.



## PIONEER IRON WORKS,

Nos. 149 to 163 William Street,  
BROOKLYN, N. Y.



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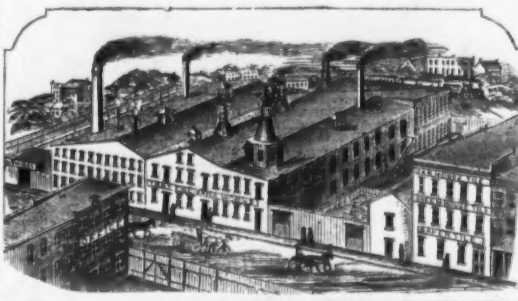
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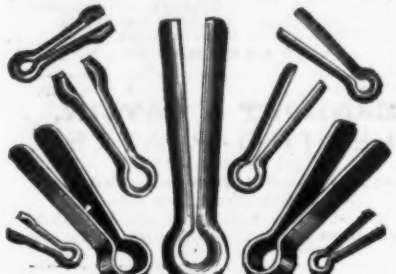
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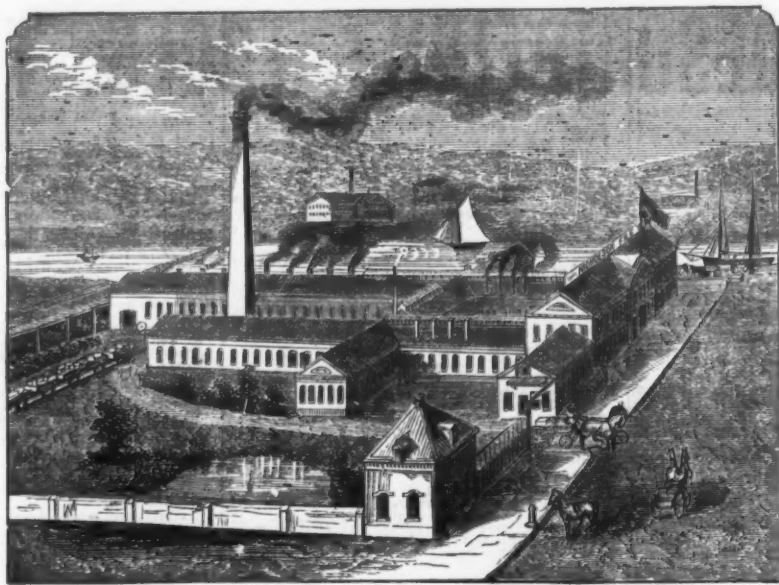
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**CLAY RETORT WORKS,**

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 Office, 58 Goerck Street, cor. Delancy Street,  
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The largest stock of Fire Brick of all shapes and sizes on hand, and made to order at short notice.  
**Cupola Brick, for McKenzie Patent,**  
 and others. Fire Mortar, Ground Brick, Clay and Sand. Superior Kaolin for Rolling Mills and Foundries. Stone Ware and other Fire Clay and Sand, from my own mines at New Jersey and Staten Island, by the cargo or otherwise.

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For Rolling Mills, Blast Furnaces, Foundries,

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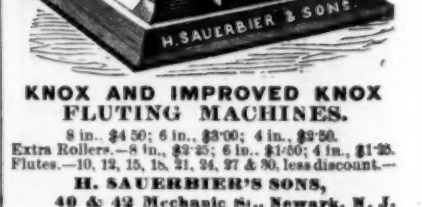
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Extra Rollers - 8 in. \$2.25; 6 in. \$1.00; 4 in. \$1.25.

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H. HOWSON, Solicitor of Patents, Attorney at Law. Communications should be addressed to the PRINCIPAL OFFICES, PHILADELPHIA



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Front and Laurel Streets. Philadelphia.

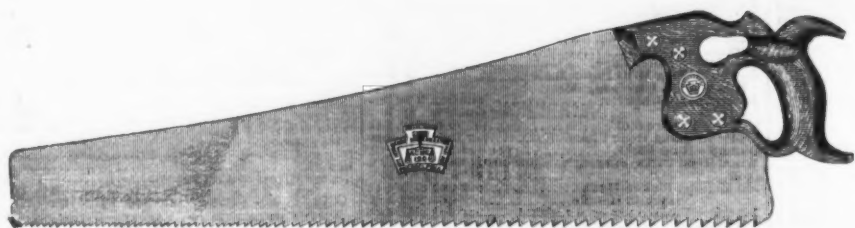
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### SAWS OF EVERY DESCRIPTION; TOOLS, FILES AND STEEL.

For Prices see our Revised Discount Sheet, dated January 1st, 1877.

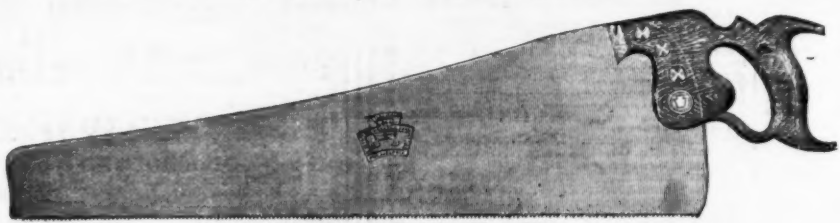
## A Few of Our CELEBRATED HAND SAWS, Etc.



Patent Double Grip Skew Back Saw.



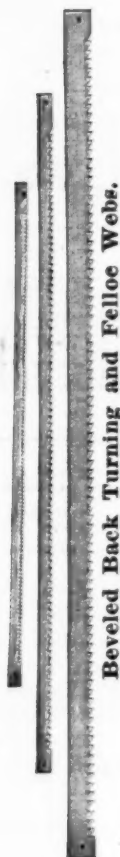
Patent Skew Back "Choice," No. 80.



Patent Skew Back, No. 76.



No. 7 Hand Saw.



Beveled Back Turning and Felloe Web.



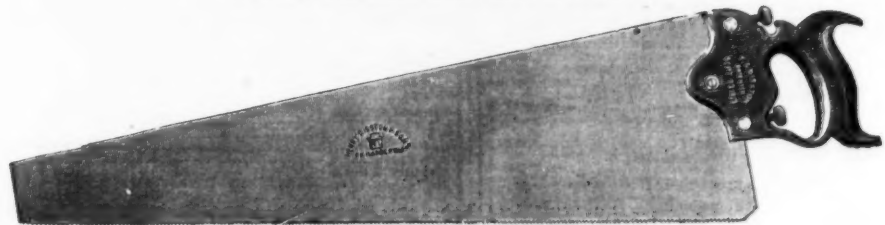
Patent Improved Combination Saw.



Patent Gauge Saw, Quality No. 7.

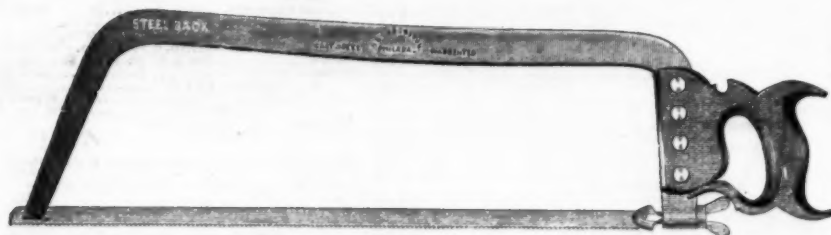


Patent Combination Saw, No. 29.

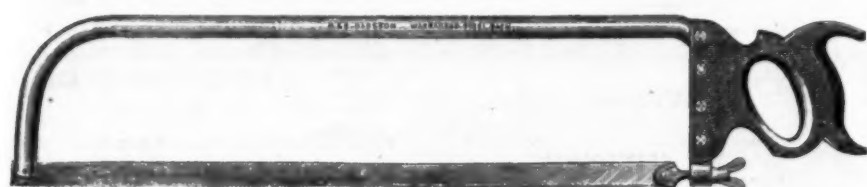


Hand Saw with Patent Adjustable Handle.

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No. 1, California Flat Steel Back, Clock Spring Blades.



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Pork Packers' Saws. Sizes, 14 to 18 inches.



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No. 4, Flat Back. Sizes, 16 to 24 inches.



[illegible]



Nail				
Block				
Dryer, Patent, Am'n.	.....	50¢	10¢	50¢
" " English	.....	11¢		90¢
Flocks	.....			
Frosting	.....			
Glyce, White	.....			
Glass, Sheet	.....			
Glasgow Points, Zinc	.....			
Gum, Copal	.....			
" Dammar	.....			
" Shellac, English	.....			
" Dark	.....			
Lathes	.....			
Pumice Stone, selected Lump	.....			
Pumice Stone, powdered	.....			
Putty in bladders	.....			
" in Pails	.....			
Rotten Stone, soft, English	.....			
Spirits Turpentine	.....			
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**Glass.**  
FRENCH WINDOW GLASS.  
*Prices current per box of 50 feet.*

Single Thick.	
SIZES.	
6 x 8 to 10 x 15.....	\$ 7 50    \$ 6 75    \$ 6 25    5 75
11 x 14 to 16 x 24.....	8 50       7 75       7 25     6 75
18 x 24 to 30 x 30.....	10 75      9 75      8 75     7 50
15 x 30 to 24 x 30.....	12 25     10 75     9 00     8 00
20 x 30 to 24 x 44.....	13 00     11 50     9 75     8 50
26 x 30 to 28 x 44.....	14 50     13 25     10 75     9 50
30 x 40 to 30 x 30.....	15 00     14 00     11 25     10 00
30 x 54 to 34 x 54.....	16 00     14 50     12 00     10 50
30 x 54 to 34 x 56.....	16 25     15 00     12 50     11 00
34 x 58 to 34 x 60.....	18 25     17 25     15 00     13 00
36 x 60 to 40 x 60.....	20 75     18 75     17 25     15 00

Double Thick.

SIZES.	
6 x 8 to 10 x 15.....	\$12 00    \$10 00    \$10 00    \$ 9 25
11 x 14 to 16 x 24.....	18 75    15 50    14 75    13 50
18 x 24 to 30 x 30.....	22 25    18 75    17 25    16 00
15 x 30 to 24 x 30.....	19 75    17 25    15 50    14 50
20 x 30 to 24 x 36.....	21 00    18 50    16 75    15 75
26 x 30 to 28 x 44.....	23 25    21 25    19 00    17 50
30 x 40 to 30 x 30.....	24 00    22 50    20 00    18 00
30 x 54 to 30 x 54.....	25 75    23 25    20 75    19 25
30 x 54 to 34 x 56.....	27 25    25 00    22 50    21 25
34 x 58 to 34 x 60.....	29 25    27 25    24 00    22 00
36 x 60 to 40 x 60.....	33 25    30 00    27 75    25 00

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**BEST HOLE AUGER.**

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In use are easily broken, bent and disabled, require no pressure. The "Fletcher" Auger will penetrate through the hardest earth to cut by the ordinary manner as to push itself speedily and without the aid of any other power.



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See. 24, 1872.



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## BURNERY:

6 feet bed, 14 inch swing.  
4 " 12 "  
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Hammer, 50 lbs.

and Sizes.  
e.



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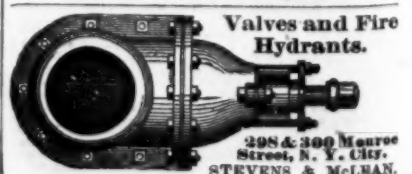


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SHOE KNIVES.

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Indispensable  
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Boudren's Patent  
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Throws a powerful light 100 feet ahead of  
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Try one—you will be pleased with it.  
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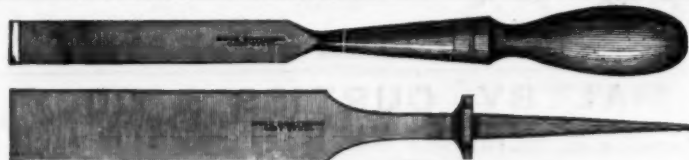
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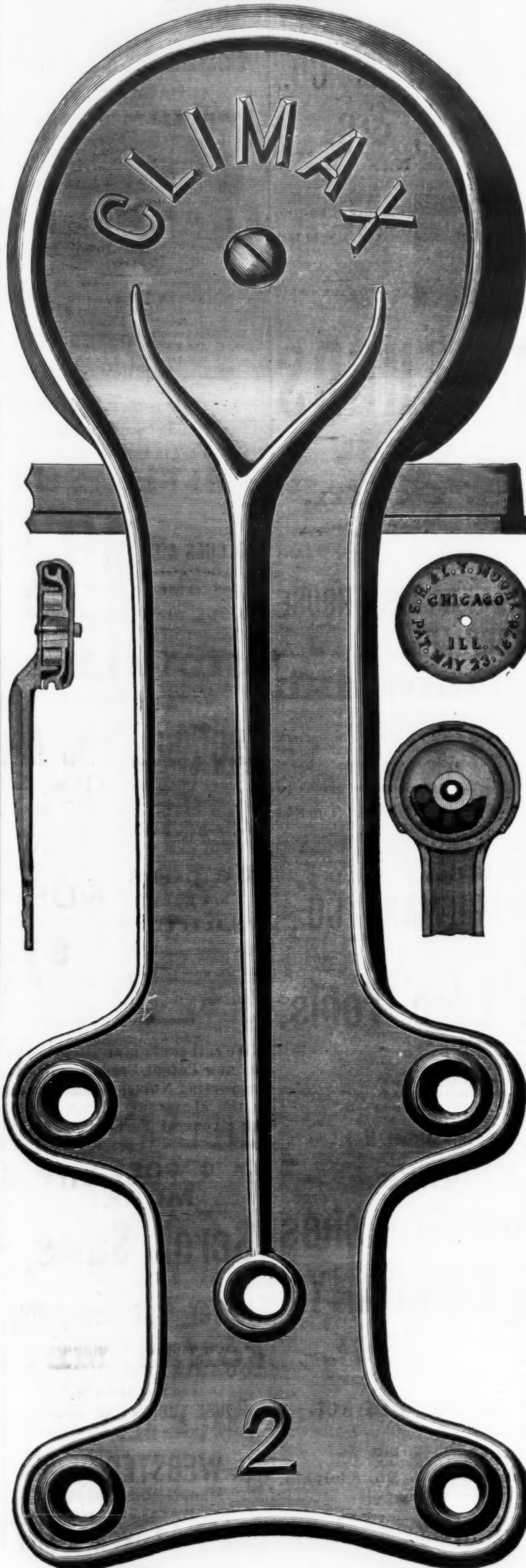
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Weight, 5 1/2 lbs. per pair. Packed 1 doz. pairs in a case.

RAIL, with Double or Single Flange ..... per foot, .....  
Packed 200 feet in a case.

Discount to the trade. Send for descriptive circulars. For sale by the hardware trade generally.

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Emery, Grindstones, &amp;c.



USE THE BEST.

THE BEST IS ALWAYS  
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Stones gotten up or labeled in  
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Our stones are of good keen  
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Manufacturer of

Butchers' Tools, Machinery,

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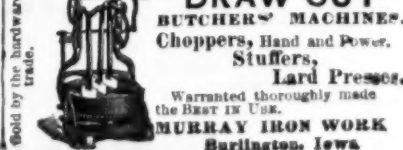
Upright Sausage Stuffers.

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Choppers, Hand and Power.

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Warranted thoroughly made

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FILES and HORSE RASPS.

Rough & Ready  
And  
CLIPPER SCYTHES,  
Warranted.



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Agents for  
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"BE A WARE"  
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"WIDE AWAKE"  
AXES.

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HARDWARE CO.,**

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ESTABLISHED 1830.

Manufacturers of

**BUILDERS' HARDWARE, BUTTS, HOUSE  
TRIMMINGS, CARRIAGE,  
And GENERAL HARDWARE**

The attention of our old Customers and the Trade generally is invited to our new Illustrated Catalogue just issued, comprising a full assortment of our well known staple goods: Butts (Drilled and Wire jointed), Thumb Latches, Sash, Upright Screw and Side Pulleys, Wardrobe and Harness Hooks, Draw Pulls, Nut Crackers, Cork Screws, &c., &c. Also several new and attractive styles of Fancy Hardware, at prices to suit the times.

Our new Patent Fancy Open Work Cap Butt, with Ornamented Knuckle, in Real and Imitation Bronze, and our Nickel Plated Cap Butts, with concealed Screws, are the handsomest in the market, and are attracting much attention. While making plain and japanned goods a specialty, we are prepared to meet the increasing demand for ornamented bronze and nickel plated House Trimmings. Goods packed in boxes or bundles, as may be preferred. For catalogue and price list address

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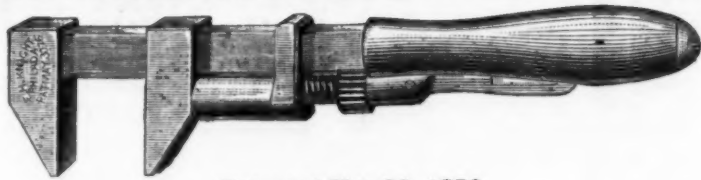
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"STEEL BAR." SAVES HALF THE TIME.

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Manufacturers of Copper, Brass, and Iron Rivets: Common and Swedes Iron, Leathered, Carpet, Lace and Glass Tacks: Finishing, Bungalow, Trunk, Coat and Glass Box Nails, &c. Rivets made to Order.

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Manufacturers of every variety of

**TACKS & SMALL NAILS,**  
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Tire Bolts, Coach Screws,  
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Protected by 14 patents.

1871....3,501 doz. | 1873....12,000 doz. | 1875....30,000 doz.  
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MANN'S PATENT.

Best Sieve known; Clean, Neat and Durable.

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Our goods have been very much improved recently, by making the Bar WIDE, as shown in the cut, which makes a 12 in. Wrench as strong as a 15 in. made in the ordinary way, and by using

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Which cannot be forced back into the handle.

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We call particular attention to our new Patent Ferrule, with its Supporting Nut (shown in section in the above cut), which makes the strongest Ferrule fastening known.

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**Scroll Saws,**

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Flower Pot Brackets,  
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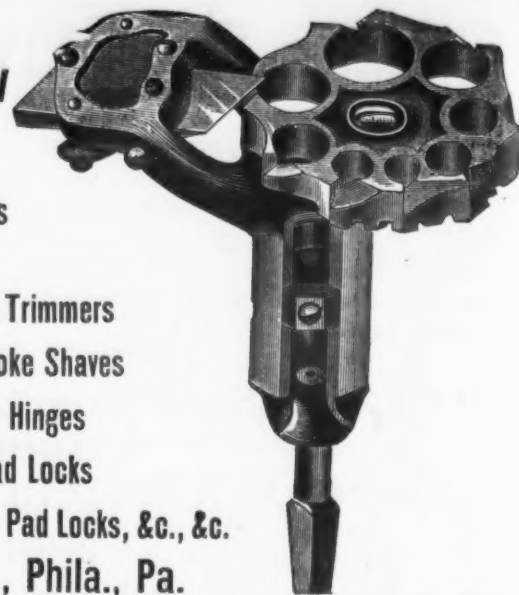
Double Edge Sook Shaves

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**The American Club Skate Still Ahead**

After the severest tests for the past four years, these skates are now admitted to be the only practical SELF-ADJUSTING SKATES IN MARKET. The clamps are first adjusted to the shoe by turning the thumb-screw D when the lever C is in the above position; when once adjusted, place the skate on the foot, close the lever C, and the skate is securely fastened to the foot. By the action of the clamps, the skate is always in the center of the foot, and cannot slide from side to side as in other clamp skates. They require no heel plates, key or wrench.

**PRICE LIST.**  
No. 1.—With Blued Footplate, and Runners the same as the best.....\$5 00  
No. 2.—Same as No. 1, only nicely Nickel Plated, effectually prevents the skate from rusting..... 6 00  
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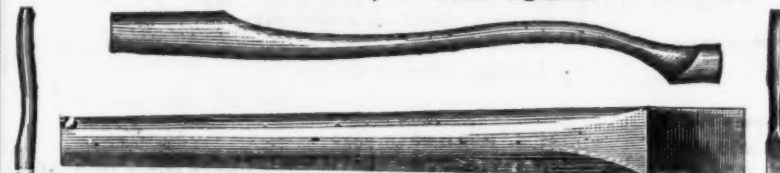
Sole Jobbing Agents for WINSLOW'S WOOD TOP SKATES.

Special trade catalogue sent on application. Address,

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With Purchase Gear,

Turns with half the labor that is required in turning other wringers. It is the latest Improved Universal Wringer, with Howell's Double Gear, with the addition of the Purchase Gear and Steel Spring which prevents the usual strain upon the rolls.

The exclusive sale for a town will be given to the first responsible applicant, so long as a reasonable number is sold.

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for Gas, Water and Steam. Send for Circular.

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AND THE

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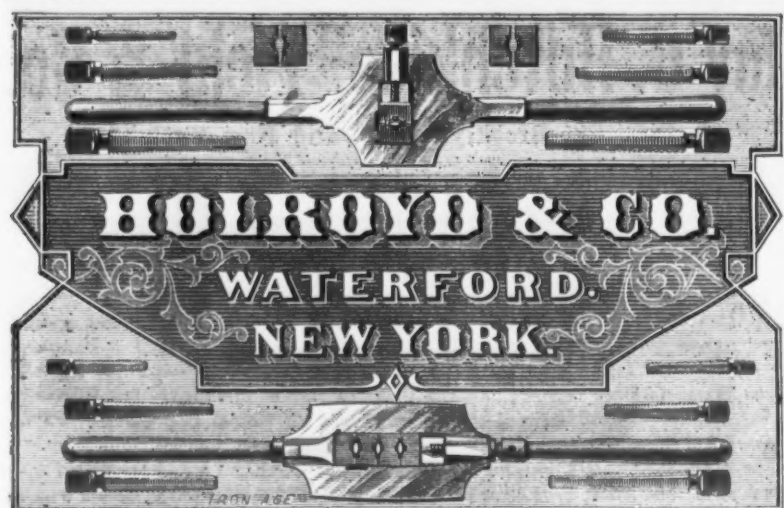
34 READE ST., N. Y.



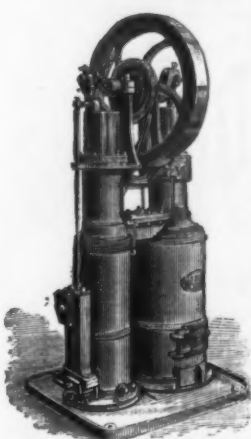








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**NO BOILER,  
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NO DANGER.**

**Uses air as a Motive Power.  
VALVELESS, NOISELESS,  
Requires no Skilled Engineer.**

Costs only from FIVE to TEN CENTS per day for fuel.  
Particularly desirable for supplying  
RAILROAD TANKS, RESIDENCES, HOTELS, PUB-  
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**SPECIALTIES**—Stone Cutters' Hammers and Tools, Quarrymen's Drills, Wedges and Half Rounds, &c., &c., &c. Miners' Hammers and Tools, Blacksmiths' Hammers and Tools, Patent Hammers for picking burr stone. Also the common Mill Picks and Wood wedges Steel or Iron, &c. Solid eye Picks, with one lb. of best Cast Steel inserted in each side. The above goods are warranted superior to none, both in quality and style of finish. All hammers have true eye and polished faces, and are made from solid cast steel. No charge is made for boxing or carting at Augusta; shipping facilities are excellent. Hammers made to any pattern or drawing. Capacity of works, one ton of hammers per day. A full line of the above goods constantly in stock. Catalogue on application.



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Anti-friction and noiseless; maximum blast and minimum power; all sizes for

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## KEYSTONE EXHAUST BLOWERS.

Made on same principle.  
For Ventilating Mines, Buildings, etc.; Removing Dust, Shavings, etc.; Drying Wool, Lumber, etc. Every Blower Guaranteed. Send for circular, or call and see them in operation.

KEYSTONE PORTABLE FORGE CO.,

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Also, sole manufacturers of the celebrated KEYSTONE PORTABLE FORGES, for all classes of work, from the lightest to the heaviest.

## The C. O. D. Engine COSTS LESS

And is equal to any Engine in the market.  
ALL WORKING PARTS WELL FINISHED.

No. 1, Cylinder 4x6, \$125.00  
No. 2, " 5x7, \$150.00

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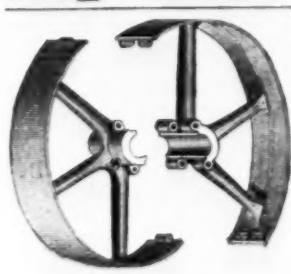
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Also, Importers and Manufacturers of

Wheeler's Self-Adjusting Pipe Wrench,

AND

SCRIPTURE'S FUNNEL TOP OILERS.



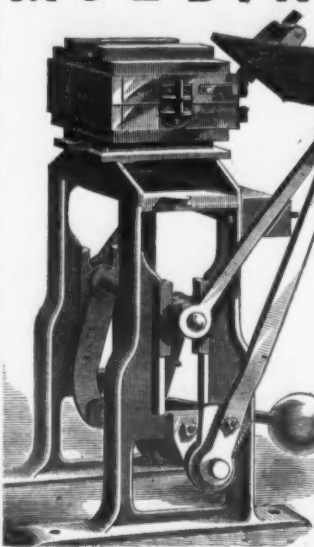
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Of same price, strength and appearance as WHOLE PULLEYS and WHOLE COLLARS.

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## MOLDING MACHINE.



Prices Reduced.

**T. F. HAMMER'S PATENT.**

Beside all advantages Molding Machines possess over hand molding, it is especially adapted for this machine that

It requires no special flasks or boards but the same are used as for hand molding.

It occupies no more room than a bench for hand molding.

It produces at less cost more, smoother and uniform castings.

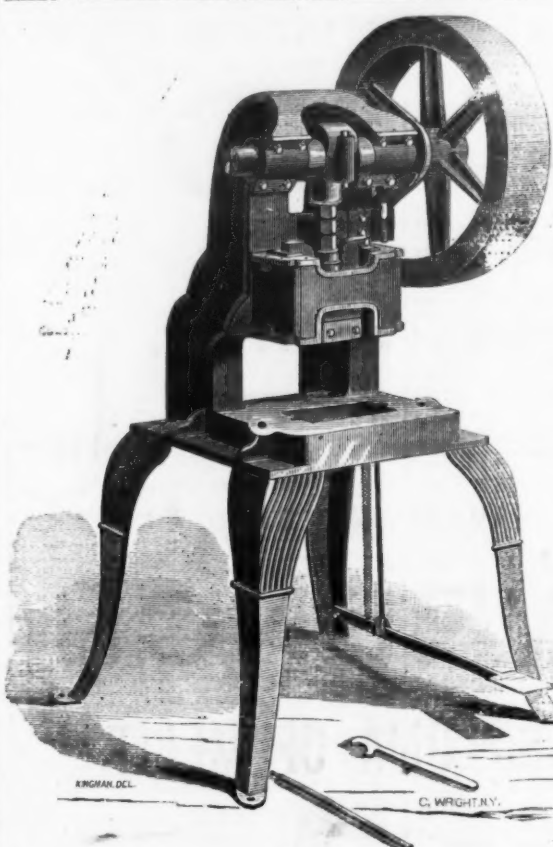
Price List on application.

**T. F. HAMMER,**

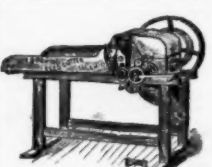
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Malleable Iron Castings made to order.



**BLISS & WILLIAMS,**  
PRESSES, DIES, & SPECIAL MACHINES.  
FOR WORKING SHEET METALS, &c.  
167 to 173 Plymouth Street, Cor. of Jay, Brooklyn, N. Y.



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## Improved Feed Cutters

HORSE POWERS,

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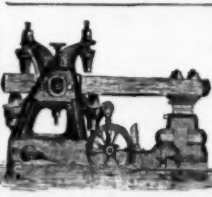
Clamps.

WATER TUYERE IRONS,

Blacksmith Drills, Saw Gummers, &c.

Liberal discounts to the trade.

Send for price lists.



## BRADLEY'S Cushioned Helve Hammer

Has Won Golden Opinions from the Mechanical World during the four years it has been before the public, and has reached a sale of 300 Hammers, all in successful operation, in this and foreign countries.

It Has More Good Points, Less Complication, More Adaptability, Larger Capacity, Does More and Better Work, Takes Less Power, Costs less for Repairs than any Hammer in the World. GUARANTEED AS REPRESENTED, and "DON'T YOU FORGET IT."

Established 1832.

**BRADLEY MFG. CO., Syracuse, N. Y.**

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## Hydraulic Jacks and Punches,

ROLLER TUBE EXPANDERS

And Direct-Acting Steam Hammers.

Communications by letter will receive prompt attention.

JACKS for Pressing on Car Wheels or CRANK PINS made to order

## HYDRAULIC JACKS

AND

**PUNCHES**

For Raising Heavy Weights, Punching Iron, Etc.

**HYDRAULIC PRESSES**

On hand and made to order.

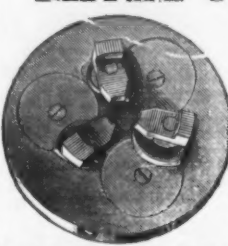
Second Hand Hydraulic Presses Bought and Sold.

Machinery for Polishing and Buffing Metals.

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## JOHNSON'S PATENT UNIVERSAL LATHE CHUCK.



We invite attention to the superior construction of this chuck. Its working parts are absolutely protected from dirt and chips. It is strong, compact and durable, and will hold the greatest variety of work, as the jaws are adjustable with a range the full diameter of the chuck. For Price List address

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**HOLSKE MACHINE CO.,**

279 Cherry St., near Jefferson St.

## ELEVATORS

For Hotels & Stores a specialty.

Machinery in general made to order.

## Ornamental Lanterns.

**KRAMER & BOLZ, 180 Grand St.,**

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SCALE AND TESTING WORKS

ESTABLISHED 1848

Patented Furnace Charging Scale.

Double Beam R. R. Truck Scale, Compound Parallel Crane Scales, &c. Patented First Power Lever Wagon Scales. Testing Machines any capacity. Send for Illustrated Price List.

Send for Illustrated Price List.

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**Bellows Factory and**

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ESTABLISHED 1852.

## JOSEPH CHURCHYARD,

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CLINTON, cor. ADAMS STS.,

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**SASH, BLINDS DOORS,**

Cisterns, Tanks, Stairs, Hand Rails, Newels, Mirror Frames, Mantels, Curtain Cornices, Book Cases, Veneered Doors, Mouldings, and complete interior and exterior finish for houses.

**ROUGH AND PLANED LUMBER,**

Flooring, Siding, Shingles, Lath and Fence Posts.

**Blacksmiths' & Moulders' Bellows.**

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## THE JUDSON GOVERNOR.

It is a common method to advertise Governor's without cost, unless satisfactory to the customer, and then charge High Prices for doing what any good Governor will do. Various Governors inferior to the "Judson" are sold in this way, operating well enough for three months, to insure collection of the pay, but becoming useless after a year's wear—their construction lacking durability. The Judson Governor is guaranteed to be not only the best Regulator of Steam Engines, but also the most durable Governor made. Parties in buying other Governors should stipulate that their durability be guaranteed, and should also take care that they do not, for much inferior Governors, pay higher prices than those shown in the accompanying list. We guarantee the Judson Governor will do all any other Governor can do, and in Accuracy and Durability—the main essentials—we guarantee it shall do more.

## Reduced Price List,

JANUARY 25th, 1876.

For dimensions of Governor, see Illustrated Price List.



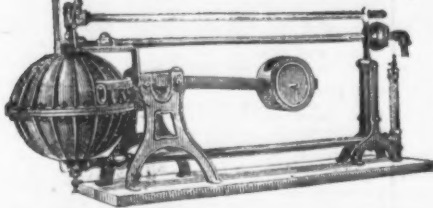
THE JUDSON PATENT Improved Steam Governor.

No Charge for Boxing & Cartage.

JUNIOUS JUDSON & SON, Rochester, N. Y.

Size, Inch.	Plain.	Bright, polished.	Extra for Lever.	Stop Valve.
1/2	\$17.00	\$19.00	\$1.90	..
3/4	19.00	21.00	1.90	..
1	21.00	24.00	2.00	\$5.00
1 1/4	25.00	28.00	2.25	6.00
1 1/2	29.00	32.00	2.50	8.00
2	35.00	40.00	2.75	10.00
2 1/4	42.00	48.00	3.25	14.00
2 1/2	45.00	51.00	3.50	15.00
2 3/4	49.00	56.00	3.75	17.00
3	55.00	63.00	4.25	20.00
3 1/4	64.00	73.00	4.50	25.00
4	74.00	84.00	5.00	30.00
4 1/4	86.00	97.00	5.50	36.00
5	94.00	106.00	6.00	42.00
5 1/4	119.00	128.00	6.50	48.00
6	125.00	138.00	7.00	54.00
6 1/4	150.00	165.00	8.00	66.00
8	185.00	202.00	9.00	80.00
9	205.00	225.00	10.00	..

## The Albany Steam Trap.



This Trap automatically drains the water of condensation from Heating Coils, and returns the same to the Boiler whether the Coils are above or below the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Apply to

Albany Steam Trap Company, Albany, N. Y.

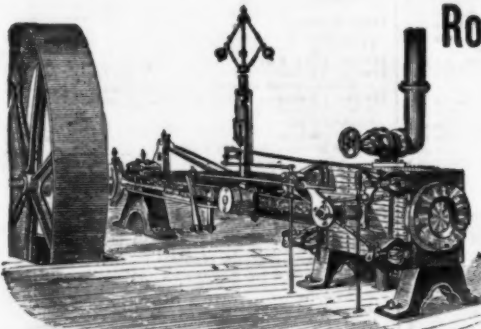
## The Pratt & Whitney Co., Hartford, Conn.,

Have constantly on hand and making

## Drop Hammers



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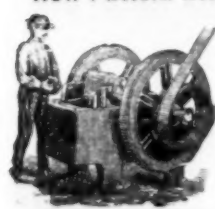
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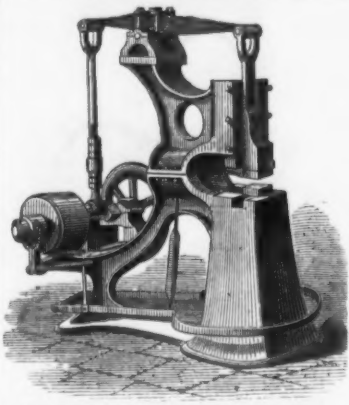


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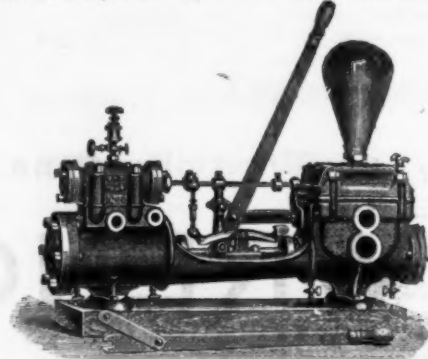
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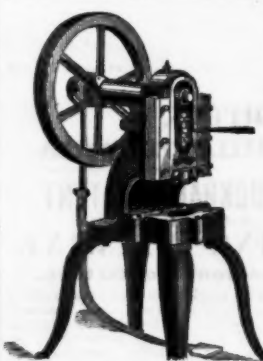
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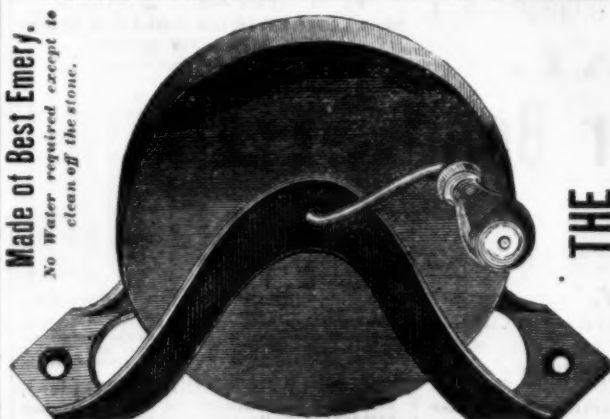


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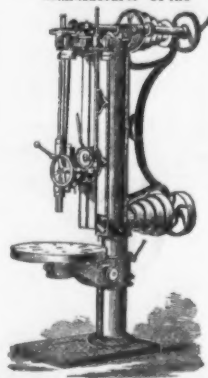


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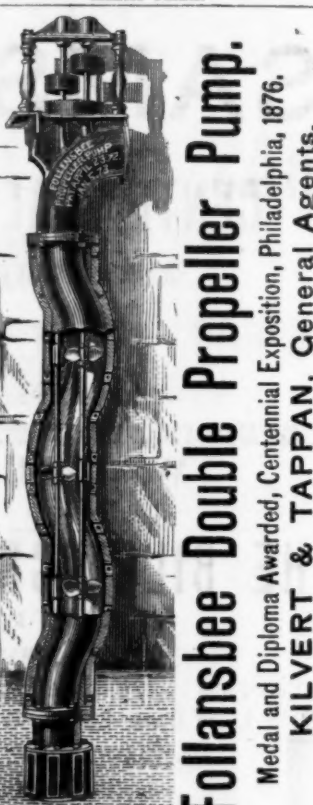


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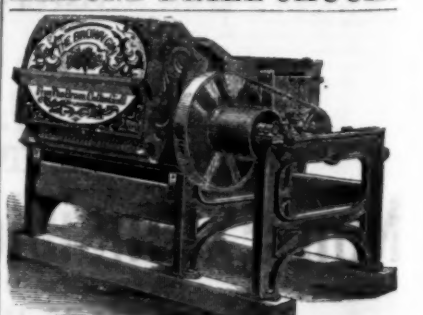
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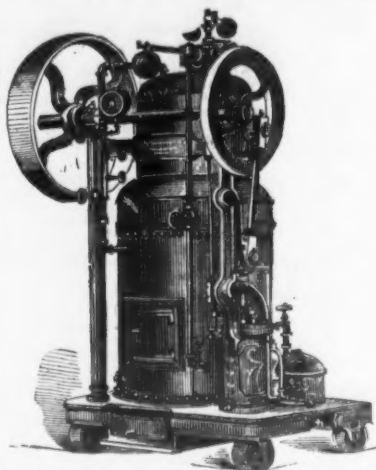
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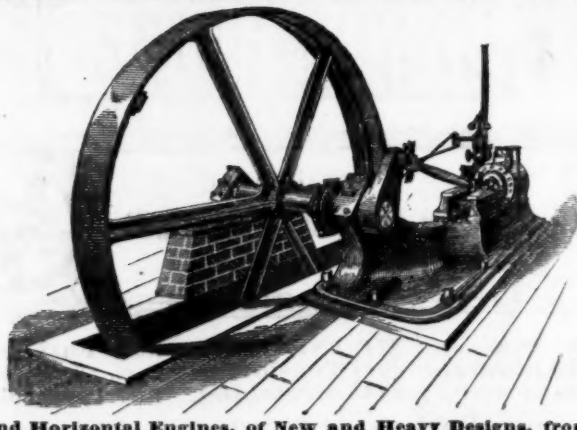
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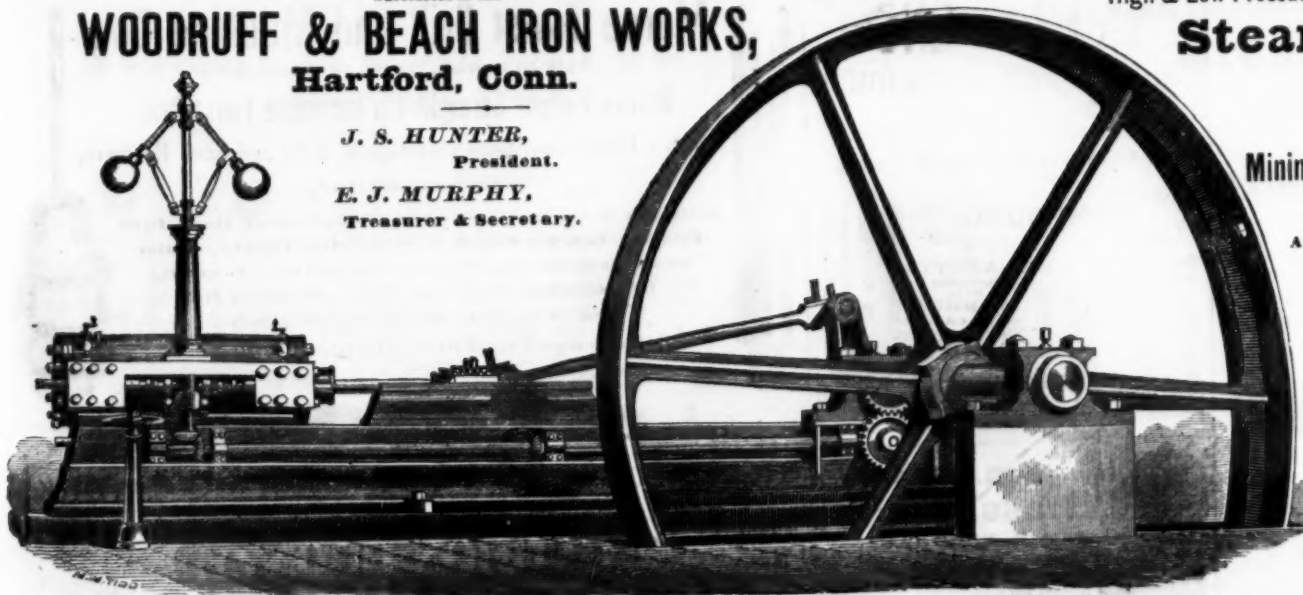
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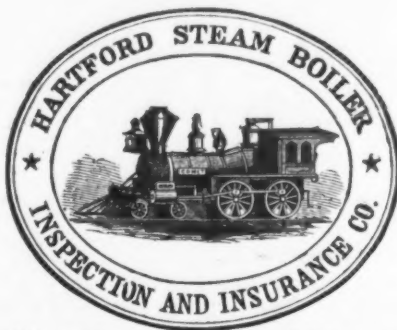
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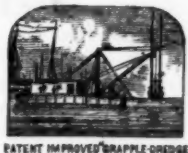
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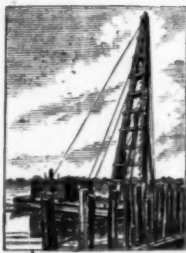
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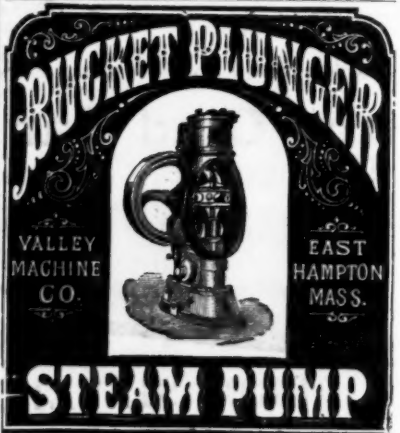


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In Department V, Group 3, at the 44th  
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which are at once simple, elegant, and effective.  
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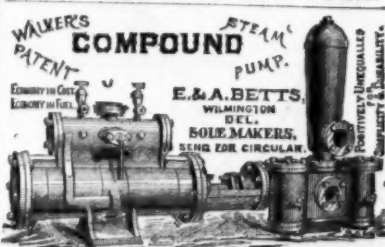
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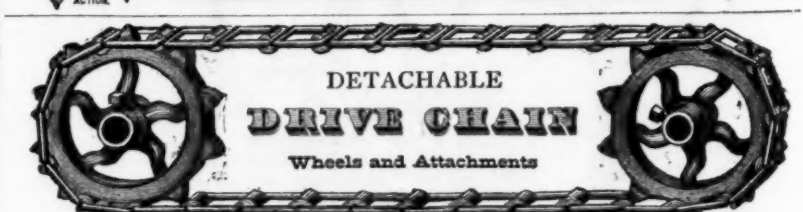
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